MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

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WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

This REVIEW presents a general summary of the meteorological data collected by the Signal Service during the month of April, 1882.

The weather has been particularly favorable for agricultural pursuits in almost every section of the country, and trustworthy reports indicate that the crops of cereals will be above the average, and in the southern sections of the country, where there is an unusually large acreage of wheat, an early and abundant crop is anticipated.

The April rains on the Pacific coast have placed the crop in that region out of danger, and in the southern sections of California, the pasturage is reported to be excellent.

In the northwestern states, and in sections of Tennessee and Kentucky, the peach, cherry and pear crops were injured by April frosts, while in the eastern sections of the country the fruit crop is well advanced and promises to compare favorably with the average yield.

The severe storms of the month passed over the central part of the United States from Colorado eastward, south of the average course of April storms, and were in almost every case attended by local storms and tornadoes which proved destructive to both life and property.

A new feature of THE WEATHER REVIEW will be found under the head of "Cotton-Region Reports." The Chief Signal Officer has recently begun a system of daily telegraphic reports for the benefit of those interested in this staple, and the accompanying table gives the monthly mean of the maximum and minimum temperatures and the average rainfall for the month in the various cotton districts throughout the south.

A general interpretation of the reports for the month will show that the weather has been favorable; the observer at Chattanooga reports that cotton-planting is proceeding rapidly and that the acreage is 40 per cent. greater than in 1881. It is estimated that 25,000 bales will be produced in Hamilton county, Tennessee.

That part of THE REVIEW referring to International Meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of February, 1880, and the tracks of barometric minima for May, 1880, traced from simultaneous observations taken at 7.35 a. m., Washington mean time. It will be seen that the cold weather which prevailed over Europe during January, 1880, continued until about the 10th of February, when the extended area of high barometer in that region disappeared, and was followed by a succession of storms over northern and northwestern Europe, attended by southerly winds and warmer weather.

The magnetic storm which occurred during the auroral display of the 16th is of special interest. Reports show that the display was visible westward from the British Isles to the Pacific coast, and that vessels on the Atlantic apparently changed their course both to the north and south of the true course when the display was most brilliant.

An unusual number of icebergs were encountered by vessels in the North Atlantic during the month, and at the close of April the danger to shipping approaching the coast, was very great. An examination of chart number vii., which exhibits the limits within which ice was observed, suggests the advisability of selecting the southern routes for vessels passing to and from Europe at this season of the year. Under the heading of "Ocean Ice," will be found special reports giving the latitude and longitude in which icebergs were observered.

In the prepartion of this REVIEW the following data have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-five Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and ninety monthly journals and one hundred and seventy-three monthly means from the former, and fifteen monthly means from the latter; one hundred and ninety-five monthly registers from voluntary observers; sixty monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of "The New York Maritime Register"; monthly reports from the local weather services of Kansas, Nebraska and Missouri, and of the Central Pacific railway company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The mean barometric pressure for the month over the United States and Canada is shown by the isobarometric lines, in black on chart ii. The area of lowest mean pressure extends from southern Arizona, northeastward over northern New Mexico and the greater part of Colorado. While a second area of low pressure is central in the north Atlantic and extends to the westward over the Gulf of Saint Lawrence. The barometer is highest north of Lake Superior and Minnesota. From the chart it will be seen that the area of mean high barometer extends over the central part of the continent. Compared with the previous month, the pressure is from five-

hundredths to one-tenth of an inch lower at stations on the Atlantic and Gulf coasts. In the Rocky mountain regions, the pressure is from fifteen to twenty-five hundredths lower. The area of low barometer now extends over the regions covered by the area of greatest pressure for March. On the Pacific coast, the pressure has remained about stationary at San Francisco and has fallen at stations north and south, the greatest change being in the north of Oregon. Compared with April, 1881, the mean pressure is from one-tenth to twenty-five hundredths of an inch greater in the northeastern part of the United States, one-tenth of an inch greater in the lake region, and slightly less at stations in the southern part of the United States.

DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the means of previous years, the pressure is slightly above the normal along the Atlantic coast, and from five-hundredths to one-tenth of an inch above in the lake region and Minnesota. It is slightly above the normal on the Pacific coast, and slightly below at stations in Colorado, New Mexico and Utah.

BAROMETRIC RANGES.

The range of pressure during the present month has varied from two-tenths of an inch to one and four-tenths inches. The least range being at Campo, California, and the greatest range at Eastport, Maine; generally the range increases with the latitude and from the Mississippi valley eastward to the Atlantic coast. In the several districts the barometric ranges have been as follows:

New England: 1.40 inches at Eastport; 1.23 inches at New Haven, and 0.97 of an inch on the summit of Mount Washington.

Middle Atlantic States: 1.16 inches at New York; 0.92 of an inch at Lynchburg.

South Atlantic States: 1 inch at Cape Henry; 0.65 of an inch at Jacksonville.

Florida: 0.36 of an inch at Key West, and 0.55 of an inch at Cedar Keys.

East Gulf States: 0.69 of an inch at Montgomery, and 0.54 of an inch at Port Eads.

West Gulf States: 0.80 of an inch at Fort Gibson, and 0.62 of an inch at Brownsville.

Ohio Valley and Tennessee: 0.94 of an inch at Columbus; 0.67 of an inch at Knoxville.

Lower Lake Region: 1.22 inches at Oswego; 1.03 inches at Cleveland.

Upper Lake Region: 1.24 inches at Alpena; 0.85 of an inch at Duluth.

Upper Mississippi Valley: 1.04 inches at La Crosse; 0.84 of an inch at St Paul.

Missouri Valley: 0.96 of an inch at Omaha; 0.82 of inch at Springfield, Mo.

Extreme Northwest: 0.92 of an inch at Fort Buford; 0.77 of an inch at Moorhead.

Northern Slope: 1.12 inches at Fort Shaw; 1.01 inches at Fort Keogh.

Middle Slope: 0.95 of an inch at Dodge City; 0.64 of an inch at Pike's Peak.

Southern Slope: 0.70 of an inch at Concho; 0.62 of an inch at Stockton.

Northern Plateau: 0.89 of an inch at Spokane Falls, and 0.75 of an inch at Boise City.

Middle Plateau: 0.69 of an inch at Salt Lake City; 0.50 of an inch at Winnemucca.

Southern Plateau: 0.45 of an inch at Prescott; 0.35 of an inch at Florence.

North Pacific Coast: 1.16 inches at Portland; 0.89 of an inch at Olympia.

Middle Pacific Coast: 0.56 of an ich at Red Bluff; 0.45 of an inch at Sacramento.

South Pacific Coast: 0.46 of an inch at Yuma; 0.20 of an inch at Campo.

AREAS OF HIGH BAROMETER.

Six areas of high barometer have passed over the region of Signal Service stations during the month, four of which approached from the central part of British America and passed to the southeast over New England to the Atlantic, and two extended over the region west of the Mississippi, moving slowly to the eastward over the states south of the Ohio river.

In addition to the areas of high barometer traced to the eastward, an extended period of high pressure occurred in central British America and northern United States from the tenth to the fourteenth of the month.

I. The morning telegraphic report of the second indicated a rapid increase of pressure at Fort Garry and in the region of Lake Superior, immediately to the west of the storm which was then central in the upper Saint Lawrence valley. Northerly winds and light snows were reported from stations on Lake Superior, where the temperature had fallen 23° in the last sixteen hours. At the afternoon report of the second this area was central north of Lake Superior, apparently moving to the eastward. On the morning of the third the barometer had risen to 30.53 at Quebec, a rise of four-tenths of an inch in twenty-four hours, accompanied by northerly winds and temperature 15° above zero. The pressure increased at the centre of this area, as it moved to the eastward, from 30.20 to 30.50. During the fourth the pressure increased at the stations on the Atlantic coast where the wind directions indicated that the course of this area became more southerly after leaving the coast line.

II. This appeared first in the region north of the upper Missouri valley, following storm traced as low area ii. At this report there was a rapid gradient in the northwest quadrant of the depression, which was central near Marquette, where the barometer read 29.71. At Fort Garry the barometer read 30.41, with northerly winds and temperature 4° above zero. This area passed to the eastward, north of the Signal Service stations near the fiftieth parallel of north latitude, until the centre reached longitude seventy-two west, when the course changed to the southeast over northern New England to the Atlantic. As in the preceding area, the pressure increased at the centre until it reached the coast; but after passing the coast-line, the movement was more to the east, and at the stations on the south Atlantic coast the pressure changed but slightly. The winds shifted to the northeast on the New England and Middle Atlantic coasts, and the barometer was highest in the Saint Lawrence valley, and light rains occurred at the coast stations, accompanied by winds ranging in velocities from twenty-six to forty miles per hour between Capes Cod and Hatteras.

III. This appeared in British America north of Dakota, at midnight of the sixth, when low area iii. was central in Colorado. During the seventh it moved directly to the east and was north of Lake Superior at midnight of that date, the low area referred to above remaining almost stationary.

On the morning of the eighth it extended north of the lake region and the upper Saint Lawrence valley, the barometer at the centre reaching 30.40. The succeeding reports show the gradual disappearance of this area, or a westerly movement, attended by the rapid advance of the depression iii. from Colorado. The barometer continued high at the northern stations, and by morning of the ninth the area of greatest pressure extended over Manitoba. The barometer continued high in this region, ranging from 30.30 to 30.50, causing northerly winds and low temperatures in the northern districts of the United States, with occasional snows in the lake region and Canada.

On the twelfth, light snows occurred in New York and New England. Stations in these districts were under the influence of an extended area of low barometer which passed from the Atlantic northward east of the New England coast. During the thirteenth and fourteenth the pressure remained above 30.40 in the region between the Mississippi and the Missouri rivers, without a decided change in the pressure at stations south and east of this region until the fifteenth.

IV., resulted from an easterly movement of the permanent area of high pressure which extended over the centre of the continent from the eleventh to the fourteenth. On the afternoon of the fourteenth the pressure was greatest in Manitoba and sixteen hours later it was greatest in central Texas. The isobar of 30.20 inclosing the regions of Lake Superior, southwestward over Iowa, Missouri, Arkansas, Kansas, and Indian Territory. The advance of a low area from the upper Missouri valley attended a southeasterly movement of this area. The barometer remained highest near Cairo until midnight of the sixteenth, the pressure being above the normal from the northern lakes southward to the Gulf coast. On the seventeenth, the pressure diminished rapidly west of the Mississippi, as this area disappeared off the south Atlantic coast.

V. The midnight report of the twentieth indicated the approach of this area from the region north of Lake Superior, while storm viii. was central in western Kansas. The barometer rose in the districts north of the Ohio river as the storm above referred to, moved to the eastward, causing an increase of the barometric gradients in the northeastern quadrants of the depression. These conditions continued until the night of the twenty-second, when the high area was central north of Lake Huron and storm viii. was central in the Ohio valley. The barometer continued high in the lake region during the twenty-third, and it rose at stations to the westward, attended by northerly winds and fair weather in the districts north of Virginia and Tennessee. These conditions continued until the morning of the twenty-sixth, when the high area had advanced to the Canadian maritime provinces, the movement to the east being apparently increased by the advance of a storm which was then in the Mississippi valley. The barometer continued near 30.30 in this area, as it moved off the northeast coast, being about the same pressure that was observed on the twentieth, when it appeared in the northwest.

VI. On the twenty-seventh, the pressure was about 30.30 on the coast stations of Oregon and Washington territory, and cold northerly winds with light snow were reported at the northern Rocky mountain stations. The midnight report of the twenty-seventh showed an increase of pressure to the eastward, the barometer ranging about 30.40 in the upper Missouri valley. By midnight of the twenty-eighth the barometer was rising as far eastward as the lake region, and southward to Arkansas, the barometer reaching the maximum, 30.63, at Fort Custer at this report. The pressure decreased slowly at the centre as this area extended over the central part of the United States on the twenty-ninth. A light norther occurred on the Texas coast between three and eleven p. m. on the twenty-ninth, with but a slight change in temperature. The centre passed slowly over the Missouri valley on the thirtieth and at the close of the month was near Memphis, the isobar of 30.20 inclosing the states of the lower Mississippi valley and a part of Texas.

AREAS OF LOW BAROMETER.

Eleven areas of low barometer have appeared within the limits of, or approached the stations of observations during the month, which were sufficiently well-defined to render it possible to approximately determine the positions of the centres at consecutive telegraphic reports. The tracks of the centres of these depressions are exhibited as usual on chart i. Compared with April of previous years, the barometric disturbances have been more numerous than in April of 1881, and less frequent than in April of 1879–80:

The following table shows the number of areas of low barometer occurring during the month of April since 1873, as traced on chart i. of THE MONTHLY WEATHER REVIEW:

Month.	Year.	No.	Month.	Year.	No.
April,	1873,	8.	April,	1878,	9.
"	1874,	13.	"	1879,	18.
"	1875,	10.	"	1880,	14.
"	1876,	13.	"	1881,	7.
"	1877,	9.	"	1882,	11.

It will be seen from the above that the number of low areas occurring during the current month is the average number occurring for April, as determined from the past ten years of observations.

The following table gives the latitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First Observed.		Last Observed.		Average h'orly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.	49° 0′	101°	47°	68°	28.5
II.	49°	111°	52°	63°	48
III.	35° 0′	107°	42° 0′	68°	30
IV.	42°	112°	32° 0′	77°	19.5
V.	42°	67°	50°	64°	10
VI.	45°	124°	27° 0′	84° 0′	25.5
VII.	40°	109° 0′	44°	66°	29.5
VIII.	48°	108°	34°	76° 0′	17
IX.	41°	107°	38°	74°	31
X.	40°	69°	43°	69° 0′	21
XI.	48°	92°	40° 0′	87°	47

Generally the storm tracks of the current month, are to the south of those of the preceding month, and the storms which developed the greatest energy are traced from the central Rocky mountain region, almost directly eastward over the central part of the United States. Only one disturbuance was traced from the Pacific coast eastward, and this disappeared southward to the Gulf coast.

I.—The morning weather chart of the first exhibited an area of high pressure off the New England coast, where the barometer was 30.50. The barometric pressure of 29.80 was central over Manitoba, attended by east to south winds and fair weather in all districts east of the Rocky mountains. During the first, this depression moved rapidly to the eastward, and on the morning of the second, it had reached the upper Saint Lawrence valley, enclosed by an isobar of 29.70. It passed over northern New England on the second, causing snow at the northern stations and dangerous northeast to northwest winds off the middle Atlantic and New England coasts, and high winds extending to the northeast as far as Sidney. Signals were displayed at the lake stations at the close of the month and were ordered at stations on the Atlantic coast between Hatteras and Newport, on the morning of the second.

The following maximum velocities were reported:

Hatteras, 36 miles, s. w.; Delaware Breakwater, 36, s. w.; Shoreham, 32, s. w.; Boston, 32, n. w.; Portland, 26, n.

II.—This probably developed in the north Pacific and passed over the north Pacific coast to Montana where it was central on the afternoon of the second, but not clearly defined. On the morning of the third it was central in Manitoba, where the barometer was 29.64—a fall of 0.54 of an inch in twenty-four hours. This storm developed energy during the day as its course changed from east to south of east, the centre of disturbance passing over Lake Superior. After reaching the upper Saint Lawrence valley, the course changed to the northeast, and the depression disappeared, followed by south to west gales at Father Point, and at stations on the New England coast. The pressure diminished at the centre of this area as it moved eastward and when last observed the barometer had fallen to 29.37 at Anticosti on the afternoon of the third. Following this storm, the temperature fell below freezing at stations in the northern portions of the United States, east of the Missouri valley. Signals were displayed in advance of this storm at stations on the lakes and at the Atlantic coast stations north of Kittyhawk.

They were generally justified by the following maximum velocities of wind occurring during the display:

Duluth, 29 miles, n. w.; Escanaba, 41, n.; Milwaukee, 44, s. w.; Grand Haven, 36, s.; Rochester, 39, w.; Delaware Breakwater, 37, n. e.; Cape Henry, 40, n. e.; Boston, 32, s. w.; Eastport, 28, s. w.

The wind reached a velocity of fifty miles from the south at Father Point, when the centre of the storm was near Rock-

liffe, and a velocity of forty-five miles from the north after the centre had passed to the east of that station.

The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicated the presence of this storm during its passage eastward over the ocean:

On the fifth, s. s. "British Crown," latitude 43° 14′ N., longitude 43° 16′ W., strong gale to moderate breeze, cloudy, heavy head-sea, wind north-northwest. On the sixth, latitude 40° 26′ N., longitude 47° 26′ W., moderate breeze to moderate gale, clear, winds easterly to northerly. On the sixth, s. s. "Britannic," latitude 45° 41′ N., longitude 38° 25′ W., barometer 29.65, wind s. w., force, seven.

III.—This storm developed slowly in the Rocky mountain regions south of Utah during the third and fourth, but the reports of the second and third indicate that the pressure was below the mean in the northern portions of Mexico on those dates. At midnight of the fourth the barometer was below 29.90 from El Paso northward to British America, and it was above 30.10 in the Mississippi valley and on the Pacific coast. The direction of the wind reported at stations in the mountain districts, indicated a general circulation of the wind about the centre of low pressure, accompanied by occasional light rains. The morning weather map of the fifth exhibited a well-defined depression of 29.80 central near Cheyenne, but the afternoon of the same date indicated that the disturbance had lost energy and extended to the northward. On the morning of the sixth this storm was central in northern Iowa, apparently advancing towards the area of high barometer which then extended over the Saint Lawrence valley and New England. The gradient increased rapidly in front of this storm, and when it was central near Saint Paul, the barometer was one inch lower than the barometer at Montreal at the some report. The course continued northeasterly during the sixth until the centre reached its most northern latitude, near Lake Superior, when the course changed to the east. In passing over Wisconsin during the sixth the wind reached its maximum velocity from the south and southwest on Lake Michigan. On the afternoon of the seventh the course changed to southeasterly, the storm passing over New England and disappearing to the east of Nova Scotia. The pressure increased slowly at the centre of this depression as it approached the Atlantic coast. The signals ordered as warnings for the preceding storm, were continued at the lake stations in advance of this storm. When the disturbance passed over Iowa and Wisconsin, several destructive tornadoes occurred in its southeast quadrant. In Michigan twenty miles east of East Saginaw, a tornado passed to the east, tearing down houses, trees, and fences; the track being about forty rods in width. Near Hempstead in the same state, on the "Holly and Pere Marquette Railway," a tornado passed over Kalamo township, Eaton county, Michigan, destroying houses and barns, and killing a large amount of stock. This is probably the same tornado, that passed over Highlands the same night. Reports from Kalamazoo, state that a tornado passed over the western part of that county, and then over Barry and Eaton counties, all houses, barns, and fences, being destroyed in its path, which was from twenty to forty rods in width. Destructive winds and heavy rains also occurred in the vicinity of Keokuk, Iowa.

The following reports furnished through the co-operation of The "New York Herald" Weather Service, probably indicate the presence of this storm during its passage over the ocean:

On the eight s. s. "British Crown," in lat. 39° 50′ N., long. 59° 28′ W., fresh breeze to strong gale, cloudy with rain, wind north-northwest to southeast. On the ninth, lat. 39° 12′ N., long. 65° 34′ W., strong gale to moderate breeze, northerly winds. On the eight, s. s. "Arizona," lat. 44° 26′ long. 44° 13′ wind north-northwest, force 7. On the tenth, s. s. "Italy," lat. 48° 50′ N., long. 31° 56′ W., w.s.w. gale.

IV.—This storm developed in the Rocky mountain region when the preceding one was in the lake region. During the sixth, northerly winds and snow prevailed in Idaho, Montana, Utah, and Nevada, where the barometer ranged from 30.60 to 30.80. On the morning of the seventh this storm was central in Colorado, and it moved slowly eastward during the day, followed by northerly winds and snow in Wyoming and Colorado, and was preceded by southerly winds and local rains in the Mississippi and Missouri valleys and thence southeastward over the Gulf States. The course was to the northeast during the eighth, the centre being enclosed by the isobar of 29.60. It reached the most northerly point of its course on the morning of the ninth—lat. 44°, long. 96° W. This storm followed the general course of iii. until it reached the Missouri valley, and was attended by destructive tornadoes in its southern and eastern quadrants. When the centre of disturbance was in eastern Colorado, a tornado occurred in Rice county, Kansas, passing in a northerly course over the town of Chase, destroying the greater part of the town. On the same date a tornado occurred at Fort Riley, Kansas, unroofing stables and causing much damage to the officers' quarters. Tornadoes occurred on the same dates in several of the nortwestern states, as this depression passed that section of the country. The area of high barometer which extended over the region north of the lakes on the ninth, apparently caused this depression to change its course to the southeast, after which the lowest isobar enclosed a trough of low pressure extending from the lower Ohio valley to the coast. Dangerous northeast winds occurred at the lake stations during the night of the ninth, and freezing weather with light snows prevailed at stations north of the Ohio river. Northeasterly gales and light snow also occurred on the New England coast as this storm passed to the southeastward, south of Cape Hatteras on the tenth.

Signals were displayed at the stations on the upper lakes on the morning of the eighth, on the lower lakes at the afternoon report of the ninth, and at stations on the Atlantic coast between Jacksonville and Cape Cod on the morning of the tenth.

The following maximum velocities indicate the energy with which this storm passed over the lake region and Atlantic coast: Hatteras, 56 miles, n.e.; Kittyhawk, 51, n.; Cape May, 36; New Shoreham, 36, n.e.; Duluth, 38, n.e.; Milwaukee, 34, n.

V.—This depression was at no time within the limits of the stations of observation but appeared south of Nova Scotia, moving from the South Atlantic, and was central south of Yarmouth on the morning of the eleventh, when heavy snows were reported from Eastport, Halifax and Yarmouth. This disturbance moved northward over the maritime provinces on the eleventh and twelfth, inclining first to the northeast and then to the northwest, until the center of disturbance was near Father Point, where the barometer fell to 29.21. The gradient increased to the southeast from the thirteenth, when the depression was apparently forced to the northeast by the high area which extended over the northern districts of the United States.

The following reports furnished through the co-operation of "The New York Herald" weather service, probably indicates the presence of this storm during its passage over the ocean:

S. S. "Rhynland," on the seventeenth, lat. 43° 44′ N., long. 42° 5′ W; barometer, 29.79, wind-force 10, south by west; very heavy gale and sea; gale began with wind in southeast, blew hardest from south by west, hauled slowly around to northwest and died out—sea following the wind; s. s. "Celtic," on the eighteenth, in lat. 42° 20′ N., long. 49° 20′ W., strong gale, n.n.w. winds. S. S. "Catalonia," on the eighteenth, lat. 50° N., long. 20° W., strong gale, westerly winds; s. s. "Wyoming," on the eighteenth, lat. 50° 16′ N., long. 22° 21′ W., moderate to strong gale, frequent rain showers with head sea, wind northwest to southwest.

VI.—This storm passed east from the Pacific ocean on the morning of the ninth, as a slight depression, and during the ninth and tenth moved to the southeastward over the Rocky mountains to western Texas. After reaching southern Texas, the course changed to the east, the storm passing over the Gulf of Mexico on the twelfth. A severe norther occurred at

Galveston and Indianola, the wind reaching a maximum velocity of forty-four and forty-seven miles, and the temperature falling thirty degrees. Heavy local rains occurred in the Gulf states as the centre moved to the east, south of the Gulf coast, and apparently disappeared near the west coast of Florida. The norther continued in the west Gulf states until the fifteenth, and floods occurred in the Gulf states. At New Iberia, Louisiana, on the twelfth, high northwest winds occurred, destroying houses and crops. The following report has been received from that locality: There was a general destruction by a violent storm which came from the northwest on the night of the twelfth. * * * Houses were torn to pieces, and fences, provisions, forage, furniture and everything previously saved from the floods were destroyed. In Iberia parish, Louisiana, at least fifteen hundred persons were left homeless and without means of support and shelter.

The situation is appalling. The height of the flood above tide-water was nearly seventeen feet. The east side of the Teche, from Loranville to Pattersonville, one hundred miles in a straight line north and south, is a lake extending from west to east to the high ridges of Bayou Lafouche, fifty-miles wide."

Another report says: "The wind which on Wednesday, all day and night, blew strongly from the southeast along the coast of Louisiana, drove the waves from the gulf into Berwick's bay and the vast expanse of water covered the country for fifty miles east and west, from the ridge of Lafouche to the hills west of the Teche and for a hundred miles north and south. The water was thus piled up at Morgan City 4.6 inches above the flood of 1874, and very considerably above the highest flood-level ever attained before by the waters of the Atchafalaya. Houses were wrecked and damaged, and places never before inundated in the knowledge of the oldest inhabitant, were now covered with water."

VII.—This was central in Utah on the sixteenth, passing southward to the northern part of New Mexico, and northeastward over Colorado and Nebraska, with increasing energy, causing heavy rains, or snows in the Missouri valley and high southerly winds in Texas, Arkansas, Missouri, and Kansas. At four o'clock in the afternoon of the eighteenth, when the depression was central near Yankton, one of the most destructive tornadoes occurred at Brownsville, Missouri. An observer reports as follows: "A few moments before four o'clock a light wind began blowing, accompanied by light rain. Almost immediately the atmosphere became heavy and close. Two large blueish colored clouds appeared; one in the south and the other in the southwest; these clouds were apparently several miles distant, and seemed to be approaching each other with great velocity, when within about two miles of the town the two clouds united and, immediately after, a loud roaring noise was heard similar to the distant rumble of a locomotive. The noise increased as the storm approached the town. Before the clouds united each moved over an irregular and reeling course, but after they united, the cloud assumed the shape of a large funnel, the mouth hanging close to the ground. The storm-cloud moved forward in a zigzag motion with great velocity, and scarcely five minutes elapsed from the time the first cloud was seen until the town was destroyed"

Less destructive tornadoes occurred on the same date in Illinois and Iowa. After reaching northwestern Iowa, this depression inclined slightly to the southeast, and then moved to northeast over Michigan, Saint Lawrence valley, and New England, and then disappeared to the eastward of Nova Scotia on the twenty-first.

The following reports furnished through the co-operation of "The New York Herald Weather Service", probably indicate the presence of this storm over the ocean:

On the twenty-second, s. s. "Catalonia", lat. 46° 22′ N., long. 40° 11′ W., moderate gale, hazy. On same date, s. s. "Wyoming" lat. 45° 15′ N., long. 41° 46′ W., moderate gale and hail squalls. On the twenty-third, lat. 43° 43′ N., long. 46° 32′ W., fresh gale with head sea; on the twenty-second, s. s. "Nevada", lat. 41° 36′ N., long., 62° 30′ W., moderate gale; on the twenty-fifth s. s. "Britannic", lat. 40° 08′ N., long. 37° 84′ W., strong westerly wind and high head sea.

This storm developed its greatest energy while passing over the lake region, the wind reaching a maximum velocity of 44 miles, s.w., at Sandusky; 44, n.w., at Grand Haven; 41, w., at Rochester; and 42, s.w., at Buffalo. There was a destructive tornado at Pennsville, Pa., occurring about four o'clock in the afternoon on Wednesday, the nineteenth.

VIII.—This depression developed in the upper Missouri valley on the night of the nineteenth and moved southward to western Kansas, where it was central at midnight of the following day. It moved slowly to the eastward during the twenty-first and twenty-second causing heavy rains in all districts south of the lake region, and dangerous northeast gales at stations on the lakes. When central near Cairo, severe local storms occurred in the Gulf states. This depression passed to the eastward over Kentucky and North Carolina on the twentythird, and disappeared to the southeastward off the south Atlantic coast, attended by strong northeasterly gales at stations north of Charleston. On Saturday, the twenty-second, a violent tornado occurred in Pender and Brunswick counties, North Carolina. The storm moved in a northerly direction across the Cape Fear river, making a perfect lane through the woods and fields, the tract being about two hundred yards in width.

Tornadoes also occurred in Bibb county, Georgia, and Dallas county, Alabama, on the afternoon of the same date.

IX.—This storm was first observed in Colorado at midnight of the twenty-fourth, and moved directly eastward during the twenty-fifth and twenty-sixth, passing over the central part of the United States, and leaving the middle Atlantic coast on the twenty-seventh. When the course changed to the northeast, this storm followed the general direction of the coast line, developing considerable energy, and disappearing to the eastward of Nova Scotia on the twenty-eighth. On the twenty-eighth, s. s. "Britannic," lat. 41° 55′ N., long. 60° 7′ W., barometer 29.86, wind south, force seven.

X.—This was a slight depression which appeared off the New England coast on the thirtieth, apparently moving to the northeast, but the centre was at no time within the limits of the Signal Service stations.

XI.—Advanced from British America on the last day of the month and was central over lake Superior at the close of the month, as a slight barometric disturbance.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for February, 1880, and continues the series of that chart begun in January, 1877. Chart v. is prepared for May, 1880, and continues the series of that chart from November, 1877. In the preparation of these charts, which are based upon the daily charts accompanying the INTERNATIONAL BULLETIN of the Months of February and May, 1880, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung" for February and May, published under the direction of Prof. Dr. G. Neumayer, director of the German Marine Observatory, and from the "Bulletin Mensuel," published by Mr. Marc Dechrevens, of Zi-Ka-Wei, China. Chart iv. exhibits the mean pressure, the mean temperature and the prevailing direction of the wind over the northern hemisphere for the month of February, 1880, as determined from one observation every day taken at 7.35 a. m., or 0.43 p. m., Greenwich mean time.

The most marked area of low barometer extends over the north Atlantic ocean between the British Isles and Greenland, and is central near Stykkisholm, where the mean pressure for the month was 29.28, and the prevailing wind was southwest, force 5.

The barometric gradient increases rapidly to the southeast and west, and very slowly in a northeasterly direction, indicating an extension of low area over the Artic regions.

The second area of mean low barometer is central over British India, where, in the southern part of Hindostan, the mean pressure for the month was below 29.90.

Four areas of barometric maxima appear upon the chart, the most marked of which extends over eastern Siberia, where the greatest mean pressure was (30.68). This area included within its limit the eastern half of Asia. Passing to the westward, a second area enclosed by an isobar of 30.20, is marked as extending over southern Russia, from the Black to the Caspian seas. In this region, the pressure diminishes rapidly toward the Artic ocean, and at the northern stations of Europe, ranges from 29.50 to 29.80.

The third area of high barometer is central in British America near York Factory, where the average pressure for the month is 30.22 The area of high barometer usually extending over the Atlantic has moved to the westward, and includes within its limits the eastern Gulf states, the isobar of 30.20 being closed and extending from the 68th to the 88th meridian. The high area of the Pacific extends over the north Pacific coast, where the pressure ranges from 30.15 to 30.27 and increases with the latitude.

Compared with the preceding month the area of low barometer in the Artic region, central west of Iceland has moved apparently to the eastward, the region of least pressure being now near, but northeast of Iceland, where the barometer is .3 of an inch below the mean of the previous month. The pressure has also diminished in the western part of this low area, the mean at Godthaab being 29.42 or .17 of an inch below the mean of January.

In the eastern part of Asia, the region of greatest pressure, the barometer has averaged .1 of an inch below the mean for the previous month.

In North America the pressure has increased .2 of an inch near the center of the continent. The area of 30.20, which extended over the southern portion of the middle states, has moved to the southward over the eastern Gulf states, and the isobar of 30.10 has moved westward to Texas and southward from New England to Pennsylvania. The pressure has changed slightly in the lake region. In the region between the upper Mississippi and Missouri rivers, the barometer is .1 of an inch below the mean, while at the Rocky mountain stations it remains near the normal.

The most marked change in the distribution of pressure occurred on the Pacific coast. The high area which was apparently to the west of the coast line during January, having moved to the northeast over Oregon, replacing the low area of 29.90 by a general increase of pressure along the coast as far south as San Diego.

Compared with the corresponding months of previous years, the pressure was above the normal on the Atlantic, Pacific and Gulf coasts, and slightly below in the central part of the United States. In the central part of British America the pressure has averaged .24 of an inch above the mean.

The following table exhibits the mean pressure and the mean temperature for the month of February, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during February in the years 1877, 1878, and 1879:

Countries.	Barometer.		Temperature.	
	Mean, February, 1877, 1878 and 1879.	Mean, February, 1880.	Mean, February, 1877, 1878 and 1879.	Mean, February, 1880.
Algiers	30.16	30.11	58.6	59.5
Austria	29.94	30.11	39.6	33.1
British Isles	29.83	29.65	41.9	46.0
Denmark	29.78	29.79	33.5	35.8
France	30.05	30.01	47.9	43.1
Germany	29.89	29.98	37.6	36.1
India	29.96	29.93	74.9	71.3
Italy	30.00	30.06	51.4	50.5
Norway	29.63	29.57	30.5	36.5
Portugal	30.22	30.14	54.8	54.7
Russia	29.93	30.10	27.7	22.2
Spain	30.11	30.09	54.7	55.3
Sweden	29.70	29.74	23.6	29.3
Turkey	30.04	30.10	52.4	50.3

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of February, 1880, as compared with the means of three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

Station.	Mean Temperature.			Mean Barometer.		
	February, 1877-78-79.	February, 1880.	Departure.	February, 1877-78-79.	February, 1880.	Departure.
	°	°	°			
York Factory	−19.2	−28.8	− 9.6	29.98	30.22	+0.24
Godthaab	16.3	7.0	− 9.3	29.52	29.42	−0.10
Stykkisholm	32.6	28.9	− 3.7	29.51	29.28	−0.23
Tromso	25.0	36.5	+11.5	29.46	29.43	−0.03
Thorshavn	39.0	41.0	+ 2.0	29.60	29.36	−0.24
Archangel	8.1	15.8	+ 7.7	29.72	29.75	+0.03
Ekaterinburg	11.0	8.1	− 2.9	30.04	29.93	−0.11
Barnaul	4.2	5.9	+ 1.7	30.37	30.17	−0.20
Yeniseisk	1.2	1.0	− 0.2	30.29	30.25	−0.04
Nikolaievsk on the Amoor	− 4.7	−11.7	− 7.0			
Zi-Ka-Wei	37.7	39.2	+ 1.5	30.33	30.30	−0.03
Pekin	28.2	26.8	− 1.4	30.33	30.42	+0.09
Beirut	61.8	59.9	− 1.9	30.07	30.02	−0.05
Mauritius	81.7	80.2	− 1.5	29.89	29.97	+0.08
Fort Napier	78.8	75.2	− 3.6	29.84	29.80	−0.04
Paramaribo	80.3	77.8	− 2.5	30.03	30.00	−0.03
Funchal	63.8	64.9	+ 1.1	30.28	30.12	−0.16
Ponta Delgado	61.0	59.2	− 1.8	30.23	30.11	−0.12
Bridgetown	80.4	77.5	− 2.9	30.00	30.00	Normal
Navassa	78.1	75.2	− 2.9			
Melbourne	64.1	68.4	+ 4.3	30.01	30.03	+0.02
Hobart Town	63.6	67.3	+ 3.7	29.84	30.03	+0.19
Astrakhan	29.4	17.6	−11.8	30.06	30.25	+0.19
Athens	55.9	53.3	− 2.7	30.02	30.10	+0.08
Tiflis	45.2	39.0	− 6.2	30.07	30.20	+0.13
Laghouat	58.3	59.4	+ 1.1	30.19	30.16	−0.03
Fort de France	76.9	74.5	− 2.4	29.92	30.06	+0.14
Lisbon	55.2	55.8	+ 0.6	30.23	30.14	−0.09
Sandwick Manse	40.0	42.5	+ 2.5	29.69	29.49	−0.20
Malta	58.4	60.0	+ 1.6	30.05	29.99	−0.06
Madrid	49.5	50.5	+ 1.0			
Gibralter	60.4	58.5	− 1.9	30.19	30.08	−0.11
Tashkend	40.3	24.6	−15.7	30.34	30.35	+0.01
Cape Town	78.8	78.2	− 0.6	30.02	29.98	−0.04
Free Town	87.2	86.4	− 0.8	29.83	29.86	+0.03
Angra	58.2	55.9	− 2.3	30.17	30.10	−0.07
Cagliari	56.3	57.0	+ 0.7	30.00	30.01	+0.01

The temperature continued above the normal in the eastern part of North America. The reports show that this was the warmest February that has occurred in many years, especially in the United States east of the 100th meridian. At the Rocky mountain stations the temperature remained about stationary, and on the Pacific coast it ranged from 2° to 6° below the normal. It averaged more than 6° above the mean of February from Virginia northward to the Saint Lawrence valley, and from New York westward to Michigan.

The following are some of the extreme monthly mean temperatures reported at isolated stations: Lowest—York Factory, —28°.8; Nikolaievsk on the Amoor, —11°.7; Yeniseisk, +1°; Barnaul, 5°.9; Godthaab, 7°.0. Highest—Freetown, 86°.4; Mauritius, 82°; Cape Town, 78°.2; Bridgetown, 77°.5; Paramaribo, 77°.8.

The prevailing direction of the wind over North America was northeasterly on the east coast of the Gulf of Mexico and in southern California; southerly in the Mississippi and Ohio valleys, the lake region, north Pacific coast and over the plateau regions; northwesterly at stations on the eastern slope of the Rocky mountains and in the Missouri valley; westerly in Canada and the maritime provinces; variable in the central part of Mexico. Over the Atlantic, south of latitude 30°, northeasterly; north of latitude 30° and east of longitude 30°, southwesterly, and west of longitude 30°, northwesterly.

In Europe, north of the 45th parallel of latitude, the prevailing winds were from south to west; south of that parallel, at stations on the Mediterranean, they were from northeast to northwest. Westerly winds prevailed in Algiers and in Hindostan, and northerly winds are reported generally from China and Japan.

The following notes and extracts, descriptive of the meteorological conditions over Europe and the north Atlantic for February, 1880, are taken from the "Monatliche Uebersicht der Witterung": In a meteorological sense, February was

more eventful than the two preceding months; for the better description of the weather conditions the month is divided into three periods, viz.: from the first to the eighth, eighth to nineteenth, nineteenth to twenty-eighth.

The first period may be considered as a continuation of the last decade of January. In the southeastern part of central Europe, from eastern Germany to the Black sea, an area of high barometer (30.32 to 30.71) prevailed, while to the north of this region four barometric depressions occurred, moving in a direction west to east. The atmospheric disturbances in central Europe were very slight, there was almost a total absence of precipitation, and heavy frosts continued uninterruptedly. In Bavaria and Wurtemburg the frost reached its greatest intensity, minimum temperatures of +5° to —0°.4 (Fahr.) being reported from these sections.

The following notes are of interest: "Carlsruhe, February 8.—The duration of cold of the present winter surpasses that of 1829–30." A dispatch from Rorschach, dated February 7th, stated that Lake Constance froze over the night before; temperature +14° (Fahr.). In the year 1830, on the 2d of February, the lake froze over and navigation was interrupted. In Italy the winter was very severe: in Venice water froze in cisterns, causing a scarcity of drinking-water; in Naples frost and snow prevailed. About the end of the period under consideration, two depressions appeared in northwestern Europe and extended far southward. During the second period the region of barometric depressions was transferred from the north to the west of Europe. The area of high pressure continued until the tenth northwest of the Black sea. It then moved slowly to the north, and about the eighteenth was central as an area of unusually high pressure (30.71 to 30.91) in northeastern Russia.

Several slight depressions occurred in southern Europe, causing changes in wind, and accompanied by rain, and in some cases snow. The severe frosts which occurred in southern and western Europe during the two previous months were followed by warmer weather, and the region of greatest cold was transferred to central and northern Russsia during the second period of February.

In the greater part of Germany, from the sixteenth to the nineteenth, the temperature rose with southeasterly winds, while at Memel with east and southeast winds, quite the contrary took place. At Memel, during the eighteenth and nineteenth, the minimum temperature occurred, while in western Germany, the maximum was reached on the nineteenth.

During the third period (twentieth to end of month) several depressions of great energy passed over northwestern Europe moving eastward. On the twenty-fourth the area of high barometer extended from the British Isles to central Russia, so that in the whole of middle and southern Europe, as far south as the Mediterranean, fresh easterly and northerly winds prevailed, by which the temperature of this region was considerably lowered. This area of high barometer was subsesquently driven first to the south, then to the southwest of the continent, where it remained until the end of the month. Over the north Atlantic, west of the 50th meridian, during the first decade of the month the barometer was high and fair weather with northwesterly winds prevailed with few interruptions of falling barometer and southwesterly winds, heavy rains occurring when the direction of the wind changed.

3d, in 42° N., 65° W., s.w. wind, force 10, torrents of rain, followed by clear weather.

9th, in 39° N., 66° W., n.n.w. wind, force 10.

10th, in 43° N., 53° W., w.s.w. to n.w. wind, force 8–10.

From the tenth to the twentieth in this part of the Atlantic the winds were variable, chiefly from s.w. to n.w., and the barometer ranged from 29.50 to 30.32.

11th, in 41° N., 61° W., n.w., force 10.

13th, in 40° N., 56° W., s.w., force 10.

14th, in 41° N., 51° W., w.s.w., force 9.

16th, in 41° N., 59° W., n.w., force 8, rain and hail squalls.

From the twentieth to the end of the month calm and fair weather, moderately high barometer and easterly winds prevailed.

The following vessel reports indicate the occurrence of storms on the middle Atlantic, on the dates named:

1st, in 47° N. 37° W., s.w., force 8.

5th, in 48° N. 30° W., s.w., force 10.

6th, in 47° N. 35° W., w.n.w., force 10.

7th, in 41° N. 38° W., n.w., force 10.

8th, in 43° N. 34° W., w. force 9.

10th, in 48° N. 33° W., w.n.w., force 10, thunder, rain, and hail squalls.

Same date in 46° N. 45° W., w., force 11–12, hail and snow.

16th, in 46° N. 46° W., hurricane-like s.e. storm, and torrent of rain, barometer 28.62.

16th to 18th, in 43° N. 40° W., S.S.W., 10 by W. 11 to N. 10, hurricane squalls with rain, hail and lightning.

23rd, in 44° N. 45° W., s.s.e., force 8.

The following vessel reports indicate the occurrence of storms over the ocean east of the thirtieth meridian, or west of the European coast, during the month:

6th, in 46° N., 28° W., n.w., force 8, squally.

8th, in 50° N., 12° W., s. to n.e., force 8.

9th, in 49° N., 8° W., w., force 11, squally, barometer 28.54.

10th, in 43° N., 26° W., n.w., force 10.

13th, in 47° N., 28° W., w.n.w., force 12, hurricane, hail and rain, lightning all around, high sea.

16th, 48° N., 6° W., w.s.w., force 11, hard squalls, heavy rain, barometer 28.78.

Chart v. exhibits the tracks of barometric depressions which have been traced from the daily international charts for the month of May, 1880, supplemented by vessel reports from the north Atlantic and north Pacific. The data received is charted for each day of the month on the charts accompanying *The International Bulletin* for each day, and from these charts and additional reports, the movements of the centers of barometric minima are traced.

Twenty-five of the principal storm-areas occurring in the northern hemisphere have thus been traced on the daily charts.

Concerning the general distribution of these barometric disturbances, the following is given.

Nine passed over parts of the United States and Canada. Three of these were first observed on the Pacific coast west of Oregon. One approached the stations of observation from the Gulf of Mexico, south of 25th parallel.

The general movement of the storms occurring in North America was to the northeast. Four of these depressions have been traced over the Atiantic, but in only two cases were sufficient vessel-reports received to warrant the tracing of a continuous storm from North America across the Atlantic.

Two regions of barometric disturbance are exhibited over Europe, one extending from east to west from the North sea to northern Russia; the other extending along the north coast of the Mediterranean.

The region of barometric disturbance in eastern Asia extends from the coast of China northeastward to the island of Yesso, the mean track of the low-areas passing to the west of Japan and south of Corea.

The following brief description is given of the storms first appearing within the limits of the Signal Service stations.

I. On the second and third of the month, the barometer was high on the Atlantic coast and a depression was central on the eastern slope of the Rocky mountains. The circulation of the winds in the southern sections of the United States and the gradual fall of the barometer along the coast of the Gulf of Mexico indicated the advance of a disturbance from the south or southwest. On the third, this area apparently moved in an easterly direction over the Gulf of Mexico, passing over Florida, between Punta Rassa and Cedar Keys during the night. On the fourth, the course changed to the northeast and the centre of disturbance passed to the east of, and parallel to, the south Atlantic coast. The morning report of the fifth, showed the centre to be near Cape Hatteras, moving to the northeast, and later re-

ports received from vessels enable us to trace the centre to the southern point of Nova Scotia, where it was central on the sixth as a storm of great energy. The following maximum velocities of wind at stations near the centre of disturbance indicate the severity of this storm: Charleston, n.e., 25 miles; Macon, North Carolina, s.e., 32 miles; Cape Lookout, s.e., 40 miles; Hatteras, s.e., 47 miles; Kittyhawk, n.e., 38 miles; Chincoteague, n.e., 39 miles; Eastport, n., 27 miles. The following marine reports were of service in determining the track. Brig "Sisters" at New York, May 9th, reports heavy s.e. gale on May 4th, lasting ten hours. Ship "Niagara", May 5th, off Hatteras, stove bulwarks, etc., during n.e. gale. Barque "Windermere" at New York, May 7th, from Colombo, January 31st, reports, on May 5th, had revolving hurricane, lasting seven hours. Brig "Edith Hall" at New York, May 10th, from Bahia, reports, May 5th, terrific s.e. gale and tremendous sea. Bark "Elinor" in 37° N., 70° W., May 6th, hurricane from n.e. to s.w., lasting twenty-four hours, during which the vessel lost her top-mast.

A slight depression developed in British America on the fourth and passed southeastward over the Saint Lawrence valley on the fifth, apparently uniting with this storm, when the centre of disturbance was near Yarmouth on the morning of the sixth. The chart of the seventh showed a fall of .55 of an inch in the barometer at Saint John's, and the following report, from the same station, showed a rise of .16 of an inch, with west wind. The following reports from vessels in the north Atlantic are interesting, in connection with the study of this storm: May 5th, lat. 42° 10′ N., long. 56° 35′ W., s. s. "Crown" s.w. gale with heavy sea for twelve hours. May 7th, lat. 41° 34′ N., long. 58° 48′ W., s. s. "Baltic," ssw., force 8 to 9, violent gale, high southwesterly sea. In 41° N., 66° W., sw., w. and nw., strong gale, high sea. May 8th, s. s. "Nederland," passed through this storm in lat. 43° N., long. 42° W., barometer 29.86, sw., force 4, high south-southwest sea; on the ninth, the same vessel reports in 41° N., 47° W., barometer 30.19, temperature 46°, a fall of 16°, wind nnw, showing the advance of an area of high pressure to the westward of this storm. The indications are that this storm passed to the eastward over the Atlantic, but the reports are not sufficient to warrant the charting of its continuous course. It disappeared to the east of Nova Scotia on the eighth, followed by a rapid increase of pressure at stations on the Atlantic coast.

II.—This storm approached the Pacific coast from the west on the fourth, where a sudden fall in the barometer was reported from stations in Washington territory and Oregon. The pressure at Roseburg and Portland, being .42 of an inch below the mean pressure for the month. On the fifth, the area moved rapidly to the eastward, crossing the Rocky mountains a little to the north of the boundary line, the pressure ranging from .63 to .65 of an inch below the mean at Forts Stevenson and Buford. On the sixth the course changed to the southeast, and the centre of the depression passed over Iowa, with loss of energy and increasing pressure at the centre. On the sixth, the barometer was 29.41 at Omaha and on the following morning the centre was near Des Moines, after which its course changed to the northeast, the storm passing over Wisconsin, Lake Superior, and thence towards the southern portion of Hudson's Bay. South to southeast gales occurred on Lakes Michigan, Erie and Huron, as the depression passed to the northeast, maximum velocities of wind ranged from thirty to thirty-six miles per hour. Several disasters occurred on the north Pacific coast when this disturbance was central near Portland. This disturbance appeared to the northeast of the coast of Labrador on the 8th, and was followed by a second depression, which extended from British America southward to Texas, this last separating two areas of high barometer, one central in the Saint Lawrence valley and the other over the Pacific coast, west of California.

III.—This developed in the Rocky mountain regions on the eighth and passed over Minnesota and Lake Superior on the ninth, attended by heavy rains as far south as the Ohio valley. The course changed to the north near Duluth, and on the morning of the tenth the centre was near Moose Factory, where the pressure was 29.58, wind s.w. Gales occurred on the ninth, the storm-centre becoming unusually well-defined, enclosed by an isobar of 29.40 as it passed over this region. After reaching the 56th parallel of latitude, the course changed to the east and then to the southeast, the centre passing over the Gulf of Saint Lawrence on the morning of the twelfth, attended by violent gales in the Canadian maritime provinces. On the thirteenth it was central in lat. 49° N., long. 59° W., where the barometer fell to 29.58, with high n. to n.e. winds; high north winds were also reported on the same date on the Atlantic coast between Halifax and Hatteras; northwest gales were also reported on the 14th in 41° N., 68° W. In 37° 30′ N., 56° 00′ W. hurricane, very heavy sea; lost topmasts. In 36° N., 68° W., May 15th, ship "Wattikka," severe gale from s.e. In 36° N., 64° W., schooner "Eider," May 15th, severe gale. On the same date, in 30° N., 60° 30′ W., schooner "Lewis" 29.85, s.s.w., high; heavy sea and threatening. On the sixteenth. in 50° N., 40° W., "Altmore," s.s.w. gale for twenty-four hours; decks swept. In 56° 23′ N., 28° 55′ W., s.w. hurricane; tremendous sea. In 40° N., 44° W., "Castelar," s.s.w. hurricane for six hours; in 42° 20′ N., 48° 00′ W., "Kroenen", severe gale, s.s.w. On the 17th, in 44° N., 45° W., s. s. "Celtic," w., strong gale; in 42° N., 48° W., s. s. "Vaderland," w.s.w., moderate gale, cloudy, high sea. The above reports, considered in connection with the regular simultaneous reports, enable us to trace this depression over the north Atlantic ocean to Iceland, and thence eastward to the northern coast of Norway.

IV.—The barometer fell rapidly at stations on the Pacific coast on the tenth as this depression approached from the west, accompanied by heavy rains as far south as San Francisco, and light rains to San Diego. On the eleventh, when the centre of disturbance was near the coast line, the pressure was .53 of an inch below the mean at Portland. This storm, although severe when first observed, passed rapidly over the Rocky mountains on the thirteenth and fourteenth, losing much of its energy and finally disappearing before reaching the Mississippi valley.

V.—This storm developed in the upper Missouri valley on the sixteenth and passed slowly over Dakota on the seventeenth, the barometer falling to 29.40 at Breckenridge. On the 18th it moved eastward over Lake Superior and continued its easterly course during the nineteenth and twentieth, losing much of its energy and finally disappearing northeast of Quebec.

VI.—This developed in Texas on the twentieth, and moved slowly over Indian Territory and the lower Ohio valley, causing rains in the southern states. On the 21st this storm was central near Cairo, from which point it moved to the north, developing energy as the centre of disturbance passed over Lake Huron. On the morning of the twenty-third the disturbance had reached the southern part of Hudson's Bay, the barometer at Moose Factory reading 29.68, a fall of .42 of an inch in twenty-four hours.

VII.—This was first observed on the Pacific coast on the twenty-third, central west of Victoria. The barometer fell rapidly at stations on the north Pacific coast on that date, as the centre passed rapidly over the coast range and thence eastward to Manitoba, where it was central on the twenty-fourth, the barometer being .62 of an inch below the mean for the month. This depression probably united with VIII, which developed on the eastern slope of the Rocky mountains.

VIII.—This storm was central in Nebraska on the twenty-fourth, where the pressure was .34 of an inch below the normal. On the twenty-sixth, the centre of disturbance had passed eastward over Lake Superior and beyond the stations of observation. Heavy rains occurred in the northern quadrants of this storm, but the most noticeable feature was the high temperature attending the south winds in the

Mississippi and Ohio valleys. This warm wave gradually extended over states east of the Mississippi, causing unusually warm weather for May; rains were light in the southern quadrants of the storm, until the wind shifted to the west and northwest.

IX.—On the 29th, the barometer fell in Texas and the adjoining states, accompanied by light rains northward to Missouri. On the 30th, the storm, thus developed, increased in energy as it advanced to the northeast over Lakes Michigan and Huron. The pressure was .5 of an inch below the mean at stations near the centre of disturbance, and the rain area included that portion of the United States east of the Mississippi. The following maximum wind velocities occurred on the northern lakes: Michigan, 28 miles, n.w.; Ontario, 26 miles, w. On the 31st, this storm moved beyond the limits of the stations of observation. Dangerous, s.e. to s.w., winds occurred on the Atlantic coast, maximum velocities being thirty-six miles s.e. at Chincoteague, Delaware Breakwater, thirty-four miles s. and Wood's Holl, forty miles s.w.

Of the storms occurring on the European coasts the following brief description is given:

X.—On the morning of the fifth the pressure was high over the British Isles, accompanied by high northerly winds, and a second area of high pressure extended over southeastern Russia. This depression apparently passed to the southward from the Arctic ocean during the night of the fifth and was central on the morning of the sixth near Hernosand, where the barometer had fallen .36 of an inch in the past twenty-four hours, the isobar 29.60 enclosing the stations in the northern and central portions of Sweden and Norway, where the winds were light and variable. The pressure increased rapidly in a southwesterly direction and violent northerly gales occurred at stations on the northeast coast of Scotland, in the North sea and in the English channel on the sixth. The morning report of the seventh placed the centre of disturbance near Saint Petersburg with northerly winds prevailing over western Europe, the force of wind being increased by a second depression which was moving to the east over Italy.

During the eighth and ninth this storm moved to the northeast and passed beyond the stations of observation. The area of high barometer which was then south of it, apparently following its general course with increasing pressure.

XI. apparently developed off the coast of Portugal on the fourth, and moved slowly over the Mediterranean on the fifth sixth, seventh and eighth, inclining to the southward during the seventh, after which the course changed slightly to the north of east, passing over the northern portion of Italy and thence eastward to the region of the Black sea, enclosed by an isobar of 29.60. It was last observed as central near Lemberg, and disappeared over western Asia, probably uniting with an extensive area of low barometer then central in India.

XII. was central southwest of Ireland on the eighth, and moved to the southeastward over the bay of Biscay and southern France, from the ninth to the twelfth; ship "Hypolyta" reported on the eighth in 49° N., 15° W., 8 p. m., strong n.e. gale, force 11, high cross sea; midnight, eighth and ninth, gale moderating. This depression continued its easterly course over Europe until the morning of the fourteenth, when its course changed to the northeast, and during the sixteenth, seventeenth and eighteenth, it passed over central Russia and finally disappeared near longitude 50° E.

XIII. Vessel reports from mid-ocean on the twelfth and thirteenth, indicate the presence of this storm in that locality. U. S. Ship "Saratoga" near the Azores, recorded the following low pressures:

12th, in 39° N., 24° W., 29.43, heavy rain, squally.

13th, in 39° N., 20° W., 29.49, w.s.w., force 7.

On the fourteenth, easterly winds on the northern margin of this storm increased in force. S.S. "Indiana," in 51° N., 15° W., reports s.s.e., force 8, barometer 29.89. On the sixteenth the barometer at Madeira read 29.61. On the seventeenth, bark "Lizzie Wright," in 46° N., 14° W., reports s. gale, lasting twenty hours. From the seventeenth to the twentieth this area increased in energy as it passed to the eastward over the north coasts of the Mediterranean, disappearing near the Black sea on the twentieth.

XIV.—This storm probably developed in the Atlantic west of Algeria, and passed northeastward as a slight depression, reaching northern Italy on the eighteenth, where the pressure was 29.69 on the morning of that date; strong northwesterly winds prevailed in the western part of the Mediterranean on the eighteenth, and brisk to high southwest winds were reported on the same date at stations on the south coasts of the Mediterranean. An area of high barometer extended over the British isles and thence eastward to Russia, with northerly winds prevailing in Europe from the coast of France eastward to the low area, which was then central in western Siberia. This area passed to the eastward over Turkey on the nineteenth, and was central in southern Russia on the twentieth, as a slight disturbance, and on the morning of the twenty-first it had moved to the region of the Caspian sea inclosed by an isobar of 29.60. The chart of the following day indicated that a small but well-defined depression was central northeast of the Caspian sea, and reports from that region indicate that this was a continuation of xiv.

XV. and XVI. were low-areas which apparently developed in the North sea on the twentieth and twenty-second, respectively, and each passed to the northeast over the Baltic region and disappeared on the day following.

During the transit of this minor depression, an extensive area of low barometer existed in the Arctic region, north of Europe; the pressure being below 29.40 at northern stations on the twenty-second, below 29.30 on the twenty-third, and below 29.00 on the twenty-fourth, accompanied by violent s.w. gales.

XVII.—This storm was probably central as a severe storm south of Iceland on the twenty-third s. s. "Britannic" in 51° N., 23° W., reported barometer 29.87, wind w., force 7, rain and heavy west northwest swell. Other vessel-reports from this locality indicate the presence of a severe storm to the northeast of or near the coast of Ireland.

On the twenty-fourth, this storm had reached the coast of Norway, enclosed by an isobar of 29.00. The following reports from stations within the influence of this storm, show the gradient in southern portions of the depression: Brono, 28.94; Christiana, 29.13; Copenhagen, 29.60; Hamburg, 29.81. After reaching the continent the course changed to the south of east and so continued during its transit over Europe on the twenty-fifth, 26th and 27th, with rising barometer at the centre of the depression. It was last observed in eastern Russia as an extended area of 29.80.

XVIII., this depression was apparently a secondary disturbance, attending a decided depression which extended over the Arctic regions north of the British Isles, on the twenty-seventh and 28th. The general direction and force of wind on the north coast of Europe indicated the presence of a depression of great energy in the higher latitude, and the chart of the 28th exhibits a low-area to the northeast of Europe, and a well-defined area of high pressure advancing from the Atlantic, thus increasing the gradient and causing high n.w. winds at stations in western and northern Europe. This depression moved to the northeast over northern Russia on the 29th and was followed by the high-area from the Atlantic, which may be traced on the daily charts, from the Azores on the twenty-sixth to northern Europe, where it appeared immediately to the west of this depression.

The following general description of the barometric depressions traced along the coasts of China and Japan during the month of May, 1880, is taken from the "Bulletin Mensuel," published by Mr. Marc Dechrevens, of the Zi-Ka-Wei Observatory:

The storm-tracks are so traced as to indicate the approximate location of the centre of each disturbance at the hour corresponding to 7.35 a. m., Washington mean time.

XIX. This depression advanced from the interior of China on the fifth, passing a little to the south of Shanghai and after leaving the coast, curved to the northeast, following the south coast of Japan, and disappeared to the northeast of the island of Nipon, about latitude 40°.

This storm was central over Wuhu, China, at ten a. m. of the fifth, and on the evening of the seventh was north of Nipon, having advanced with an average velocity of thirty-eight miles per hour. This storm was immediately followed by a second depression which moved to the eastward over the ocean, and was felt as far south as Hong-Kong. Light rains are reported in China, and abundant rains in Japan near the centre of disturbance. The barometer fell .5 of an inch at Tomangasima light house (lat. 34° 18′ N., long. 135° 0′ E.) where the wind blew violently from the west. At Tokio, the rainfall during the sixth and seventh was 3.26 inches.

XX. This depression crossed the Gulf of Pe-Chi-Li on the eighth, moving from west to east, it passed over Corea on the ninth, and over Japan on the tenth and eleventh. Lowest barometer was observed at Tien-sin, at noon of the eighth, and at Tokio at eight p. m. of the tenth. Heavy rains occurred near the coast on the ninth. The storm was severe near the centre of depression, but the disturbance did not extend to the southern stations.

XXI.—This storm moved to the eastward over China from the w.s.w. to e.n.e., passing over Hankow (wind s. to n.e.) at noon of the eleventh. It passed over Wuhu about five p. m. of the eleventh, winds s.e. to w. and n.w. At Zi-Ka-Wei (wind s.s.e. to w.n.w. and n.) from five p. m. to midnight, barometer low and stationary. At one a. m., on the twelvth the storm increased in force and continued with great violence until five a. m., barometer rising rapidly, the wind remained s.s.e. until midnight, when it veered to the s.s.w. and then to the n.e. during the day. At nine p. m. the winds to the north of China and Japan indicated clearly the presence of a cyclonic disturbance in the straits of Corea, which soon disappeared. The lowest barometer was observed at Tokio at five p. m. on the thirteenth, when the centre of disturbance was over the sea of Japan.

XXII.—The storm approached from the southwest of China, passing over Hankow, Wei-hu, Nankin and to the north of Zi-Ka-Wei. The depression was slight and of irregular form, although violent northerly winds were reported from Hankow on the twentieth, light rain occurred at Zi-Ka-Wei on the evening of the twentieth.

The depression reached Japan on the evening of the twentieth. On the twenty-first, about noon, it passed to northwest of the light-house of Tsurisima, and on the twenty-third to the northwest of the light-house of Kinkasan. The lowest barometer at Tokio, 29.71, occurred at 3.30 p. m., on the 22d, with a moderate wind from the s.s.e. Light rains only occurred during the passage of this depression.

XXIII. this depression followed xxii, advancing from channel of Formosa, where it was central on the twentieth, and passing to the northward, it reached the straits of Corea on the twenty-third, and was over the sea of Japan on the twenty-fourth. At Tokao, on the west coast of Formosa, 5.70 inches of rain fell on the twentieth. This storm was central over the island of Yesso on the twenty-fifth.

XXIV.—Violent whirlwinds were reported from the northern provinces of China on the twenty-fifth and twenty-sixth, while this depression was central near Pekin, toward the southwest. The Pekin Gazette gives an interesting detail in its issue of the ninth of July, relative to the hail-storms of the twenty-sixth of May, which were very destructive in the districts of Honau-fau (lat. 34° 30′ N., long 112° 30′ E.). The reports show that the hail commenced at 4 p. m., and was of only short duration; the crops in several of the cereal districts were cut to pieces and destroyed.

XXV.—This was the most severe storm occurring during the month in the central parts of China. In addition to the regular reports from meteorological stations on the coasts of China and Japan, a number of marine reports have been received from vessels which encountered this storm after it left the coast. It first appeared as central southwest of Hankow on May twenty-ninth, passing to the south of that city about four p. m. (winds se.–n.) it moved along between Hankow and Wu-hu, passing the latter station at four a. m. on the morning of the thirtieth. At Zi-Ka-Wei the lowest barometer was 29.47 at 2.10 p. m., the wind veering suddenly from s.s.e. to w., reaching a maximum velocity of 29 miles at noon of the thirty-first. The central area was almost circular in form and inclosed by the isobars of 29.37, 29.53, 29.69 and 29.84 on the evening of the thirtieth, and by the isobars of 29.45, 29.61, 29.69 on the evening of the thirty-first. The United States man-of-war "Monocacy," in lat. 34° 4′ N., long. 122° 45′ E., furnishes the following report: "The wind suddenly increased in force from the southeast, the barometer reading 29.45, and subsequently fell to 29.24, and the wind ranged from 6 to 9 in force, from s.w." The centre of disturbance passed near the southern point of Corea, and then turned to the east, passing over Japan near the 35th parallel, having advanced from Hankow, China, to Yedo, Japan, where it was central on June first, in seventy hours.

OCEAN ICE.

March nineteenth, 1882, in 46′ 30′ N., 47° 30′ W., s. s. "Limosa," passed through heavy field ice, had starboard bow stove.

31st, schooner "Promise" forty-five miles s.w. of Cape Pine, was struck by large ice-floe and sunk.

April third, fourth and fifth, s. s. "Averill" passed several large icebergs between 45° 55′ N., 45° 50′ W., and 43° 49° N., 52° 56′ W.

10th, s. s. "Donau" in 46° 05′ N., 41° 36′ W., passed an iceberg.

12th, s. s. "Alaska" in 43° 13′ N., 46° 40′ W., passed field ice. On the same date, in 42° 29′ N., 55° 37′ W., s. s. "Donau," passed three large icebergs.

20th, s. s. "Alhambra," during the passage from Saint John's, Newfoundland to Halifax, Nova Scotia, passed hundreds of icebergs, some being of enormous size.

18th, s. s. "Australia," in 43° 21′ N., 48′ 07′ W., passed several large icebergs and some loose ice.

16th, s. s. "Braunschweig," in 43° 07′ N., 46° 24′ W., passed two large icebergs.

11th, s. s. "Cornwall," in 46° 19′ N., 45° 00′ W., encountered ice, which continued for twenty-four hours.

13th, s. s. "Italy," between 43° 02′ N., 46° 50′ W., and 42° 44′ N., 49° 00′ W., passed several icebergs.

15th, s. s. "Lydian Monarch," in 43° 25′ N., 46° 52′ W., passed an iceberg seventy or eighty feet high.

19th and twentieth, s. s. "Nevada," between 45° N., 46° W., and 43° N., 51° W., passed several large icebergs and great quantities of field ice.

5th, s. s. "Denmark," in 43° 23′ N., 46° 36′ W., passed an iceberg.

9th, s. s. "Donau," in 46° 05′ N., 44° 36′ W., passed an iceberg.

11th, in 43° N., 48° 40′ W., passed three large icebergs.

8th, s. s. "Gloucester," in 40° 51′ N., 52° 25′ W., passed an iceberg, from one hundred and twenty to one hundred and fifty feet high.

13th, "Salier," in 44° 42′ N., 45° 46′ W., passed a large number of icebergs and large quantities of field ice.

14th, in 43° 47′ N., 52° 20, W., passed a large iceberg.

13th, s. s. "Surrey," in 42° 30′ N., 49° 05′ W., passed several icebergs.

S. S. "Hermod," reports that on the eighth, in 45° 20′ N., 48° 00′ W., the vessel was surrounded by ice. During a strong n.e. gale and heavy swell, the ice began to move, crushing heavily against the side of the vessel. It finally stove in the bows, filling the fore compartment with water. Heavy icebergs were seen all round us. Some were apparently thousand feet long, and five to six hundred feet high.

On the 11th, in lat. 44° 00′ N., 49° 20′ W., found open water to the south, while to the n.e. and n.w. we had close ice. These fields of ice seem to end in 44° 00′ N., as south of that, no field ice could be discovered, even from the top gallant yards in clear weather, and a few icebergs only were seen.

28th, s. s. "Arizona," in 42° 37′ N., 49° 26′ W., passed a small iceberg and same day in 42° 37′ N., 50° 30′ W., passed a large iceberg.

18th, s. s. "Brantford City," in 42° 57′ N., 45° 52′ W., passed a small iceberg.

27th, s. s. "Britannic," in 42° 42′ N., 51° 55′ W., passed a small iceberg.

23d, s. s. "Devonia," in 44° 06′ N., 48° 41′ W., passed a large iceberg; same day, in 43° 41′ N., 49° 20′ W., passed another large one.

25th, s. s. "Glamorgan," in 46° 20′ N., 42° 30′ W., passed an iceberg fully five hundred feet high.

25th, s. s. "Kronprinz Friedrich Wilhelm," in 43° 51′ N., 47° 59′ W., passed two large icebergs.

24th, s. s. "Persian Monarch," in 43° N., 48° W., passed an iceberg.

S. S. "State of Nebraska," reports, from lat. 44° 38′ N., long. 44° 48′ W., to lat. 42° 26′ N., long. 50° 15′ W., passed several icebergs and a quantity of small ice.

24th, s. s. "Thingvalla," in 43° 30′ N., 47° 45′ W., saw a great many icebergs. S. s. "Valetta," arrived at Saint John's, Newfoundland, from Boston, April twenty-seventh, and reports having met ice one hundred and twenty miles se. of Louisburg, Nova Scotia, and numerous icebergs scattered along the course to Cape Race.

14th, bark "Norge" met ice in 46° 30′ N., 47° 10′ W., and got clear of it in 43° N., 48° W., passed a large number of icebergs.

April tenth, bark "Seriah," in 47° 30′ N., 47° 00′ W., encountered heavy ice-fields and was surrounded for five days. Brig "Jersey," at Saint John's, May fourth, reports, got clear of ice in lat. 43° N.

The following interesting notes respecting the opening of navigation in European ice-bound harbors are given:

Soderham, April fourth, navigation open to Ljume.

Elsinore, April seventh, navigation at Ekenaes is declared open.

Travemunde, March seventeenth, the navigation of the Azof up to Taganrog was opened March sixteenth.

Stettin, March seventeenth, the summer marks were laid out off the Kaiserfahrt yesterday.

St. Petersburg, April sixth, large quantities of ice are coming down the river; eleventh, the river and fairway are nearly free of ice.

Abo, April fifth, navigation is now open for steamers.

Narva, March thirtieth, the river is free of ice. Pernau, April eighth, navigation opened.

Bjorneborg, April fifteenth, harbor nearly free of ice, navigation opened; the ports of Fredricksham, Kotka, Borga and Nystad are open.

Pillau, the navigation at Carlstad re-opened April seventh.

The average date of the opening of the Neva at Saint Petersburg, as given by Woeikof, from data for nearly one hundred and twenty years, is about April twenty-second. It was opened this year ten days earlier than the mean date of opening.

The comparison extended to other ports where the opening of navigation is noticed, would probably show that the past winter has been generally mild in northwestern Europe, and the present spring moderate.

The "Sandusky Register" of April twenty-first, 1882, gives the following:

"A large iceberg which formed at Niagara Falls, has floated out into lake Ontario and is to be seen about one mile and a-half northeast of the harbor. It has been there several days and is attracting much attention, as it is said to be the first iceberg seen in that vicinity for the past twenty-eight years."

TEMPERATURE OF THE AIR.

The distribution of the mean temperature over the United States, for the month of April, 1882, is exhibited on chart ii by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in the several districts, as determined from observations taken at the Signal Service stations during the month of April, for previous years; the second column shows the mean temperature for the current month; the third column shows the departures of the mean temperature of the current month from the mean of several years.

The temperature has ranged from one to three degrees above the mean along the Atlantic coast from New York southward to Florida, and from two to three degrees above in the Missouri and Mississippi valleys. In New England it has been slightly above the mean, except at the station on the summit of Mount Washington, where it averaged 4.1 degrees below. On the Pacific coast and at the Rocky mountain stations, the temperature ranges from two to four degrees below the mean, the greatest deviation being in the middle plateau region, where it was 4.7 degrees below the mean. At the station on the summit of Pike's Peak, the mean temperature was .4 of a degree above the mean for the month of April.

DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of chart ii. The following items of importance, in connection with this subject, are reported by voluntary observers:

Connecticut: Southington, mean temperature 43°.3 or about 2° below the average of the past twelve years.

Illinois: Riley, mean temperature 43°.7 or 0°.4 below the average of the past twenty-one years.

Kansas: Wellington, mean temperature 55°.6 or 1°.9 below the average of the past three years. The maximum temperature, 88°, occurred on the twenty-fifth, and is the lowest maximum temperature for the three years; the minimum, 32°, occurring on the sixteenth, is the highest for the same period. Lawrence, mean temperature 58°.83 or 3°.02 above the average April temperature of the fourteen preceding years. During that period the highest April mean, 58°.60, occurred in 1878; the lowest, 48°.85 and 48°.77 occurred in 1873 and 1874, respectively; the highest maximum, 93°, occurred in 1880, and the lowest minimum, 13°, occurred in 1881.

Maine: Gardiner, mean temperature 36°.96 or 4°.38 below the average of the past forty-six years. During that period there were only two Aprils whose mean temperature are lower than that of the current year, viz: 35°.88 in 1854, and 34°.97 in 1874. The maximum temperature for April 1882, 57°, has been exceeded in every year during the above-mentioned period, with the exception of 1874, when the temperature did not rise above 52°. The minimum temperature for April, 1882, 7°, is the lowest April minimum recorded during the last forty-six years, with the exception of April, 1842, when the temperature fell to 5°

Maryland: Fallston, mean temperature 47°.7 or 2°.27 below the average of the last eleven years. During that period the highest April means, 55°.76 and 55°.47, occurred in 1871 and 1878, respectively; the lowest, 43.91, occurred in 1874.

Michigan: Thornville, mean temperature 44°.1, which is slightly below the April average.

Missouri: Saint Louis, Missouri weather service reports mean temperature 58°.7 or nearly 3° above the average of the last forty-five years.

New Hampshire.—Contoocookville, mean temperature 41°.3, or 2°.5 below the average of the past eleven years.

New York.—North Volney, mean temperature, 39°.24 or 2°.13 below the average of the past fourteen years. During that period the highest monthly mean, 50°.92 occurred in 1878;

Table of Comparative Maximum Temperatures for the Month of April.

State or Territory.	Maximum for April, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
		°		°			°		
Alabama	Mobile	89	Mobile	90	1881	Mount Vernon Arsenal	95		34 years.
Do			Montgomery	90	1880				
Arizona	Phœnix	105	Yuma	105	1876	Fort Lowell	109	1879	11 "
Do						Fort McDonald	106	1879	14 "
Arkansas	Little Rock	85	Little Rock	94	1880	Fort Smith	96		21 "
Do						Mount Ida	95	1880	7 "
California	Visalia	91	Campo	94	1876	Fort Yuma	106		30 "
Do			Los Angeles	94	1881	Fort Miller	101		13 "
Colorado	West Las Animas	83	Denver	83	1874	Fort Lyon	98		26 "
Connecticut	New Haven	72	New Haven	73	'77 & '78	New Haven	85		86 "
Do			New London	73	1877	Middletown	85		11 "
Dakota	Fort Bennett and Yankton	86	Fort Meade	89	1881	Fort Sully	98		16 "
Do			Yankton	89	1874	Fort Randall	93		22 "
Delaware	Delaware Breakwater		Delaware Breakwater	89	1880	Fort Delaware	85		45 "
Dist. of Columbia	Washington	84	Washington	87	'73 & '81	Washington	91		49 "
Florida	Key West	88	Jacksonville	91	'74 & '80	Okahumpka	99	1880	4 "
Do			Key West	91	1881	Fort King	94		10 "
Georgia	Augusta and Savannah	87	Augusta	89	'73,78'81	Augusta Arsenal	94		50 "
Do			Savannnah	89	1873	Savannah	94		37 "
Idaho	Fort Lapwai	90	Lewiston	86	1880	Fort Boise	90	1875	15 "
Do						Fort Lapwai	85		18 "
Illinois	Springfield	83	Cairo	84	1873	Rock Island Arsenal	89		11 "
Do						Chicago	84		38 "
Indiana	Indianapolis	80	Indianapolis	91	1874	Vevay	97		13 "
Indian Territory	Fort Gibson	85	Fort Sill	96	1880	Fort Sill	97		19 "
Do						Fort Gibson	95		48 "
Iowa	Des Moines	83	Des Moines	84	'79 & '80	Mount Vernon	90		13 "
Do						Iowa City	90		15 "
Do						Glenwood	92	1880	2 "
Kansas	Dodge City	87	Dodge City	92	1880	Fort Leavenworth	102		51 "
Do						Fort Larned	96		18 "
Kentucky	Louisville	85	Louisville	87	'73 & '80	Newport Barracks	89		30 "
Louisiana	Shreveport	93	Shreveport	93	1880	Fort Jesup	98		23 "
Do						Baton Rouge	96		58 "
Maine	Portland	62	Portland	78	1861	Fort Preble	90		59 "
Do						Gardiner	86		41 "
Maryland	Baltimore	82	Baltimore	84	1881	Fort Washington	93		38 "
Do						Fort McHenry	89		51 "
Massachusetts	Springfield	71	Boston	80	1881	Williamstown	87		61 "
Michigan	Detroit and Grand Haven	71	Marquette	81	1877	Fort Gratiot	94		22 "
Do						Detroit	90		41 "
Minnesota	Saint Paul	82	Saint Paul	82	1879	Fort Ridgley	90		11 "
Do						Fort Snelling	88		61 "
Mississippi	Vicksburg	86	Vicksburg	90	1881	Fayette	89	1880	6 "
Do						Columbus	86		10 "
Missouri	Springfield	89	Saint Louis	87	1881	Jefferson Barracks	94		30 "
Do						Corning	94	1880	6 "
Montana	Fort Keogh	84	Fort Keogh	90	1881	Fort Shaw	93		12 "
Nebraska	Omaha	84	North Platte	90	1880	Fort McPherson	96		8 "
Do						Omaha	96		3 "
Nevada	Winnemucca	78	Pioche	80	1879	Fort McDermit	90	1881	15 "
New Hampshire	Mount Washington	36	Mount Washington	49	1877	Concord	88		8 "
Do						Dartmouth College	86		18 "
New Jersey	Barnegat and Little Egg Harbor	74	Sandy Hook	74.5	1881	Vineland	88	1881	7 "
Do						Burnt Mills	88	1877	3 "
New Mexico	La Mesilla	95	La Mesilla	100	1879	Fort Craig	104		25 "
New York	Rochester	73	New York City	81	1877	Fort Niagara	94		53 "
Do						Ithaca	98		29 "
North Carolina	Charlotte	83	Willimgton	92	1873	Fort Johnson	88		57 "
Do						Weldon	90	'78 & '80	7 "
Ohio	Cincinnati	82	Cincinnati	85	1873	Cincinnati	93		36 "
Do						Marietta	90		53 "
Oregon	Roseburgh	80	Portland	83	1875	Fort Dallas	90		15 "
Do						Fort Haskins	90		8 "
Pennsylvania	Pittsburgh	83	Pittsburgh	88	1878	Philadelphia	88		120 "
Do						Carlisle Barracks	88		35 "
Rhode Island	Narragansett Pier	66	Newport	69	1877	Providence	82		35 "
South Carolina	Charleston	86	Charleston	87	1880	Fort Moultrie	89		38 "
Do						Charleston	88		105 "
Tennessee	Memphis	88	Chattanooga	88	1880	Ashwood	89	1880	3 "
Do						Glenwood Cottage	89		11 "
Texas	Rio Grande City	107	Rio Grande City	109	1878	Fort Ringgold	114	1878	32 "
Do						Fort McIntosh	108		27 "
Utah	Salt Lake City	73	Salt Lake City	83	1874	Kanab	86	1875	5 "
Do						Fort Crittenden	85		3 "
Vermont	Burlington	59	Burlington	75	1881	Lunenburgh	78		16 "
Do						Woodstock	78	1881	7 "
Virginia	Lynchburgh	85	Lynchburg	91.5	1873	Accotink	90	1881	6 "
Do						Fortress Monroe	91		55 "
Washington T'y	Olympia	79	Dayton	91	1880	Fort Walla Walla	96		14 "
West Virginia	Morgantown	77	Morgantown	83	1878	Wellsburgh	88	1879	1 "
Do						Helvetia	80	1878	5 "
Wisconsin	Madison	78	La Crosse	83	1879	Fort Crawford	91		28 "
Wyoming	Cheyenne and Fort Washakie	74	Cheyenne	80	1874	Fort Laramie	89		27 "

the lowest, 33°.59, occurred in 1874; the highest maximum temperature, 80°, occurred in 1881; lowest minimum, 14°, occurred in 1874. Palermo, mean temperature, 33°.6, is the lowest April mean for the past twenty-one years, and is 8°.1 below the average for the same period.

Virginia.—Wytheville, mean temperature, 54°.4, which is about 2°.4 above the average of eighteen years. During that period the highest April mean, 56°, occurred in 1866; the lowest 47°, occurred in 1881; the highest maximum, 83°, occurred in 1868 and 1878; lowest minimum, 17°, occurred in 1881.

West Virginia.—Helvetia, mean temperature, 49.9 or 1°.46 above the average of past six years.

RANGES OF TEMPERATURE AT SIGNAL SERVICE STATIONS.

Monthly ranges of temperature during the month of April varied from 21° to 69° at stations east of the Rocky mountains, and from 27° to 79° westward to the Pacific. The smallest ranges are: Punta Rassa and Key West, 21°; Port Eads, Louisiana, 23°; Cedar Keys, 25°; San Diego, California, 27°; Jacksonville, Florida, 29°; Santa Fé, Galveston, New Orleans, New Shoreham, Rhode Island, and Macon, North Carolina, 30°; Pensacola, Florida, 32°; Hatteras, North Carolina, 34°; Portsmouth, North Carolina, 36°; Cape May, New Jersey, and Smithville, North Carolina, 37°; Indianola, Mont-

gomery, Newport, Rhode Island, and Savannah, 38°; Helena, Montana; Vicksburg, Wilmington, North Carolina, and Atlanta, 39°. The largest are: Campo, California, 79°; La Mesilla, New Mexico, and Stockton, Texas, 70°; Rapid City, Dakota, 69°; Florence and Phœnix, Arizona, Fort Elliott, Texas, and Fort Meade, Dakota, 68°; Concho and Fort McKavett, Texas, 67°; San Carlos and Tucson, Arizona, Silver City, New Mexico, West Las Animas, Colorado, and El Paso, Texas, 65°. The greatest *daily* ranges varied in the different districts as follows: New England, from 15° at New Shoreham on the 9th to 37° at Mount Washington on 1st; middle Atlantic states, 21° at Cape May on 5th, and 25° at Philadelphia to 34° at Williamsport on 17th and 35° at Lynchburg on 18th; south Atlantic states, 19° at Savannah on 1st and 26th, and 21° at Hatteras on 17th, to 29° at Charlotte on 18th and 30° at Augusta on 21st; Florida peninsula, 14° at Key West on 27th, to 22° at Cedar Keys on 3d; eastern Gulf states, 19° at New Orleans on 20th, to 28° at Montgomery on 21st, and 29° at Mobile on 29th; western Gulf states, 16° at Galveston on 12th, 18° at Port Eads on 25th and 19° at Indianola on 23d, to 36° at Fredericksburg, Texas, on 19th and 23d, and 39° at San Antonio on 23d; Rio Grande valley, 27° at Brownsville on 23d, to 47° at Eagle Pass on 23d; Ohio valley and Tennessee, 29° at Indianapolis on 1st and 18th, and 29° at Cincinnati on 18th, to 34° at Pittsburg on 3d and 35° at Chattanooga on 21st; lower lake region, 29° at Oswego on 1st, 31° at Buffalo on 3d, and 31° at Erie on 4th to 37° at Cleveland and Toledo on 4th; upper lake region, 29° at Alpena on 2d, and 31° at Duluth on 3d, to 39° at Marquette on 4th; extreme northwest, 33° at Moorhead on 3d to 37° at Bismarck on 2nd, and 38° at Saint Vincent on 5th; upper Mississippi valley, 28° at Springfield on 1st, Keokuk on 5th and Cairo on 10th, to 46° at Saint Paul on 1st; Missouri valley, 29° at Springfield, Missouri, on 21st, to 47° at Yankton on 2d and 49° at Fort Bennett, Dakota, on 1st; northern slope, 25° at Helena on 19th, to 47° at Fort Keogh on 2d and 54° at Fort Benton on 4th; middle slope, 21° at Pike's Peak on 9th and 37° at Denver on 23d to 50° at West Las Animas, Colorado, on 23d, and 51° at Fort Elliott, Texas, on 25th; southern slope, 37° at Fort Griffin, Texas, on 10th, 39° at Henrietta and Jacksboro, Texas, on 20th, to 50° at Concho, Texas, on 20th, Coleman City, Texas, on 23d, and 51° at El Paso, Texas, on 9th; southern plateau, 33° at Santa Fe on 23d to 53° at La Mesilla on 26th; middle plateau, 30° at Salt Lake City on 20th, to 38° at Winnemucca, on 14th; northern plateau, 32° at Spokane Falls, Washington territory, on 3d and 13th, and 33° at Boise City on 2d to 41° at Fort Missoula on 1st; north Pacific coast region, 29° at Portland on 13th, to 40° at Olympia on 30th; middle Pacific coast region, 21° at San Francisco on 28th, to 32° at Red Bluff on 29th and 33° at Sacramento on 27th; south Pacific coast region, 24° at San Diego on 22d, to 50° at Campo on 29th.

FROSTS.

In the various districts they were reported on the following dates:

New England: 1st to 6th, 8th to 19th, 22d to 30th.

Middle Atlantic states: 1st, 3d, 4th, 9th to 18th, 23d to 28th.

Tennessee: 12th, 13th, 15th to 17th, 30th.

Ohio valley: 10th to 26th, 28th, 30th.

Lower lake region: 1st, 3d, 5th, 6th, 8th to 13th, 16th to 19th, 21st to 26th, 29th, 30th.

Upper lake region: 1st to 17th, 20th to 26th, 28th to 30th.

Extreme northwest: 1st, 2d, 4th to 7th, 9th to 15th, 19th, 20th, 22d, 28th, 29th.

Upper Mississippi valley: 1st, 10th to 17th, 20th, 21st, 23d, 24th, 27th, 29th, 30th.

Missouri valley: 6th, 8th, 10th to 12th, 14th to 17th, 20th, 27th to 30th.

Northern slope: 2d to 26th, 28th to 30th.

Southern slope: 15th.

Middle slope: 4th to 17th, 19th, 21st to 23d, 28th to 30th.

Southern plateau: 1st, 2d, 4th, 5th, 7th to 9th, 11th to 19th, 21st, 22d, 30th.

Middle plateau: 4th, 6th to 8th, 10th to 18th, 20th to 26th.

Northern plateau: 3d, 4th, 7th, 8th, 11th to 13th, 16th to 18th, 20th to 26th, 28th, 29th.

North Pacific coast region: 6th, 7th, 9th to 13th, 16th, 20th, 22d, 23d, 25th, 27th, 28th.

Middle Pacific coast region: 23d, 25th.

Frosts were also reported from the following stations not included in the districts named above: Highlands, North Carolina, on 28th; Murphy, North Carolina, 11th, 12th; Weldon, North Carolina, 13th, 17th, 24th; Little Rock, Arkansas, 15th, 17th; Mount Ida, Arkansas, 15th, 16th, 30th; San Gorgonia, California, 6th, 7th, 8th, 9th, 17th, 18th, 21st, 22d, 24th, 25th. Injury to vegetation by frosts has been reported as follows: Lynchburg, Virginia, thirteenth, light frost; great apprehension in regard to the fruit crop. Norfolk, Virginia, twenty-fifth, farmers report damage to fruit and vegetables by frost. Morgantown, West Virginia, thirteenth, fruit and crops injured. Indianapolis, thirtieth, vegetation, which at beginning of month was forward, was retarded by cold weather of latter part of month. Injury by frost is variously estimated, and is not now considered as great as was first thought. Wheat so far advanced as to shoot was killed. The loss to cherry trees is about sixty per cent; to apple trees about thirty; to peach trees, not being in full bloom, the injury is slight. Garden vegetables are backward. Logansport, Indiana, 10th, ice; it is feared that the fruit crop has suffered injury. Sandusky, eleventh, the cold weather of last night has caused much fear respecting the fruit crop. Toledo, twelvth, light frost, it is feared that fruit which is far advanced has been injured. Sandusky, fourteenth, it is now considered that the damage from cold weather of past few days has been overestimated, and that the injury is only slight. Milwaukee, twelfth, fears are entertained that crops have been injured by late frosts. Port Huron, Michigan, twelfth, it is generally reported throughout the state that the crops have been seriously injured by the late cold weather. Dubuque, eleventh, early vegetables and fruit considerably damaged by frosts of past two days. Coleman City, Texas, heavy frost, killing vegetation. Santa Fe, fourteenth, very cold; heavy frost injuring early fruit. La Mesilla, New Mexico, fifteenth, temperature 24°.5; tender vegetation generally killed or injured; appricots, peaches and apples almost entirely destroyed; leaves of tropical trees killed; twenty-ninth, temperature fell to to 29°.8, causing slight injury to tender vegetation. Vevay, Indiana, first, vegetation unusually forward. Eleventh, severe frost; all kinds of shrubbery and early flowering plants destroyed; apples, pears, plums, peaches and cherries badly injured; wheat is also damaged. Twelfth, temperature 24°; vegetation which has withstood the previous cold weather, entirely blighted. Wabash, Indiana, thirtieth, much of the early fruit is killed and wheat injured by cold weather. Charleston, Illinois, thirtieth, fruit nearly all killed by cold weather. Saint Meinrad, Indiana, eleventh, much injury done by frost. Fort Wayne, Indiana, tenth, injuring blossoms. Independence, Kansas, fifteenth, frost injuring vegetation in lowlands. Clay Centre, Kansas, thirtieth, killing potatoes, peaches, grapes and all tender plants. Creswell, Kansas, thirtieth, very heavy frost, killing potatoes and injuring fruit. Federalsburg, Maryland, twenty-third, twenty-fourth, severe frosts, seriously injuring peach crop. Pierce City, Maryland, fifteenth, killing potato vines. Bethel, Ohio, eleventh, ground frozen: fruit injured; fifteenth, fruit and wheat killed by cold weather. College Hill, Ohio, eleventh, ground frozen; much injury done to fruit. Portsmouth, Ohio, eleventh to sixteenth, heavy frosts; nearlyall of early fruit killed. New Athens, Ohio, tenth to fifteenth, nearly all of peach crop killed by cold weather; other fruits damaged. Wytheville, Virginia, tenth, eleventh, vegetation seriously injured. Variety Mills, Virginia, twelfth, unusually heavy frost, destroying vegetables. Wilmington, Delaware, eleventh, temperature below freezing, causing great anxiety respecting the peach crop. Middletown, Delaware, eleventh, although

Table of Maximum and Minimum Temperatures for March, 1882.

State or Territory.	Signal Service.			U. S. Army Post Surgeons or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	89		Opeleka	92	
Do	Montgomery		48	Uniontown		33
Arizona	Phœnix	105		Texas Hill	105	
Do	Prescott		21	Maricopa	107	
Arkansas	Little Rock	85	43	Madison	94	15
California	Visalia	91		Indio and Mammoth Tank	104	
Do	Campo		10	Fort Lyon	86	
Colorado	West Las Animas	83	18	Fort Garland		3
Do	Pike's Peak	30	— 5	Southington	69	22
Connecticut	New Haven	72	21	Forts Hall and Sully	88	
Dakota	Fort Bennett and Yankton	83		Fort Pembina		— 6
Do	Fort Meade		8			
Delaware	Del. Breakwater					
District of Columbia	Washington	84	27			
Florida	Key West	88		Live Oak	90	50
Do	Pensacola		52	Waldo	90	
Georgia	Augusta and Savannah	87		Way Cross	91	
Do				Calhoun		38
Do	Atlanta		43			
Idaho	Ft. Lapwai	80				
Do	Cœur d'Alene		20			
Illinois	Springfield	83		Anna and Charleston	86	
Do	Chicago		25			
Do				Riley		18
Indiana	Indianapolis	80	24	Vevay	86	
Do				Spiceland		23
Indian Territory	Fort Gibson	85	34			
Iowa	Des Moines	83		Cedar Rapids	91	
Do	Dubuque		25	Clinton and Cresco		20
Do						
Kansas	Dodge City	87	26	Clay Centre	94	
Kentucky	Louisville	85	31	Bowling Green	84	31
Louisiana	Shreveport	93	47	Alexandria	94	
Do				Amiti City		42
Maine	Portland	62		Dexter	62	2
Do	Eastport		9			
Maryland	Baltimore	82	29	Emmittsburg	86	24
Do				Fallston, Owing's Mills, Sandy Springs and Woodstock		24
Do						
Do						
Do						
Massachusetts	Springfield	71		Somerset	77	
Do	Boston		19	Heath		14
Michigan	Detroit and Grand Haven	71		Niles	79	
Do	Alpena		12	Fort Brady		11
Do						
Minnesota	St. Paul	82				
Do	St. Vincent		— 8			
Mississippi	Vicksburg	86	47	Hermando	92	37
Do				Bateville, Grenada and Lake		37
Do						
Missouri	Springfield	89		Protem	90	
Do	Saint Louis		29	Curryville		21
Montana	Fort Keogh	84				
Do	Fort Shaw and Deer Lodge		14	Fort Ellis and Blackf't Agency		10
Do						
Nebraska	Omaha	84		Fremont	90	
Do	North Platte		25			
Nevada	Winnemucca	78	18	Humboldt	89	
Do	Pioche		18	Boca		2
New Hampshire	Mt. Washington	36	—13	Contoocookville	64	
Do				New Market		11
New Jersey	Barnegat and Little Egg Harbor	74		Atco	81	
Do	Atlantic City		24	Somerville		21
Do						
New Mexico	La Mesilla	95		Fort Stanton		5
Do	Santa Fe		18			
New York	Rochester	73	19	Fort Hamilton	75	
Do	Buffalo		10	Plattsburg Barracks		11
Do						
North Carolina	Charlotte	83	36	Salisbury	86	20
Do				Lumberton	86	
Ohio	Cincinnati	82		Portsmouth	90	
Do	Cleveland and Toledo		22	New Athens and Ruggles		20
Do						
Oregon	Roseburg	80		Fort Klamath		7
Do	Umatilla		30			
Pennsylvania	Pittsburg	83		Dyberry		14
Do	Erie		21			
Rhode Island	Narragansett Pier	66	23			
South Carolina	Charleston	86	46	St. Matthews	90	26
Tennessee	Memphis	88		Austin		30
Do	Knoxville		36			
Texas	Rio Grande City	107				
Do	Grierson Springs		20			
Utah	Salt Lake City	73	26	Promontory	85	26
Do				Fort Douglas		26
Vermont	Burlington	59	15	Stafford	64	
Do				Lunenburg		— 2
Virginia	Lynchburg	85	30	Accotink	86	
Do	Chincoteague		30	Variety Mills		23
Washington Ter	Olympia	79	30	Fort Canby	80	
Do	Pomeroy		27			
West Virginia	Morgantown	77	23	Helvetia	80	20
Wisconsin	Madison	78		Beloit	79	
Do	La Crosse		21	Ashland		10
Wyoming	Cheyenne	74	15	Fort Fred Steele	75	6
Do	Fort Washakie	74				

the temperature fell to 29° no serious damage has resulted. Smyrna, Delaware, eleventh, about twenty per cent. of the peach buds are open; ice formed to a thickness of three-quarters of an inch; no serious damage is feared. Felton, Delaware, eleventh, no serious damage has been done to peach crop by cold weather. Bridgeville and Salisbury, Delaware, report that the peach crop prospects have not been injured. Georgetown, Delaware, eleventh, it is feared that serious injury to peach crop will result from cold weather. Fredericksburgh, Virginia, eleventh, the sudden change in temperature has endangered the peach crop in northern Virginia. Wheeling, West Virginia, eleventh, dispatches from various points in this state, Ohio and Pennsylvania show that the recent cold weather has damaged early apples, peaches and small fruits; wheat has also been injured. Columbus, Ohio, eleventh, the secretary of the state board of agriculture thinks that the fruit crop has been badly damaged, if not entirely destroyed. Farmers report the wheat crop to have suffered serious injury. Kalamazoo and South Haven, Michigan, eleventh, dispatches report prospects in the fruit-belt as flattering, aside from the damage done small fruits from the recent cold weather. Memphis, twenty-first, reports from Haywood, Tipton and Launderdale counties, Tennessee and Mississippi, and Crittenden counties, Arkansas, state that the frosts of the fourteenth, fifteenth, and sixteenth killed all cotton in those counties, necessitating replanting, which will put back farming operations about two weeks.

PRECIPITATION.

The distribution of rain-fall over the United States and Canada, as determined from observations taken at over six hundred stations, is exhibited on chart number iii. The table on the left hand corner of this chart shows the average monthly rainfall, determined from the records of Signal Service stations in the several districts, and the excess or deficiency as compared with the average for many years.

There has been a deficiency of rain-fall in New England, except on the summit of Mount Washington where the rain-fall amounted to 11.2 inches, or 7.72 inches more than the average.

In the middle and south Atlantic states, the Ohio valley and the lower lake region, the deficiency amounted to less than one inch. In Tennessee and the western Gulf States, the deficiency ranged from 1.73 to 2.05 inches. On the north Pacific coast, an excess of 2.09 inches is reported, while in the middle and south Pacific coast regions, the rain-fall was about one-half inch below the average.

At the station on the summit of Pike's Peak, 4.79 inches of rain are reported; the average for the month of April being 4.13 inches.

DEVIATIONS FROM AVERAGE PRECIPITATION.

Under this heading, departures exhibited by the reports from the regular Signal Service stations, are shown in the table of comparative monthly rain-falls, (as published in the lower left hand corner of chart iii.) The following items of importance in connection with this subject, are reported by voluntary observers:

Connecticut: Southington, monthly rain-fall 0.85 inches, which is much below the average of the past twelve years. During that period, the largest monthly precipitation for April, 5.41 inches occurred in 1870; the smallest 1.15 inches [with the exception of April, 1882,] occurred in 1881.

Illinois: Riley, monthly rain-fall 3.29 inches, or 0.60 inches above the average of the past twenty-one years. Only the monthly rain-falls of April, 1861, '68 and '72 exceeded that of the current year.

Kansas: Wellington, monthly rain-fall 3.10 inches or 1.04 inches above the average of the past three years. Lawrence, monthly rain-fall 3.20 inches or 0.17 inches above the April average for the past fourteen years. During that period the largest monthly rain-fall for April, 5.48 inches, occurred in 1878; the smallest, 1.08 and 1.27 inches, occurred in 1870 and '81 respectively. The total amount of precipitation for the four months ending April 30th, 1882, is 7.18 inches, which is

0.62 inches more than the average for the same period in the fourteen preceding years.

Maine: Gardiner, monthly precipitation 2.65 inches or 0.71 inch below the average of the past forty-six years.

Maryland: Fallston, monthly rainfall 2.82 inches, or 0.45 inch below the average for the past eleven years. During that period, the largest April rainfall 8.11 inches, occurred in 1874; the smallest 1.76 inches, occurred in 1876.

Nebraska: Sutton, monthly rainfall 10.95 inches, which has been exceeded but once in thirty years in this section, viz: at Plattsmouth in 1873, when the April precipitation was 15.90 inches.

New Hampshire: Contoocookville, monthly precipitation, 1.00 inch, is less than one-third of the April average for the past eleven years.

New York: North Volney, monthly rainfall 1.80 inches, or 0.42 inch below the average of past nine years. During that period the largest monthly precipitation 3.65 inches fell in 1874; the least, 0.65 inch fell in 1879. Palermo, monthly rainfall 1.67 inches, or 0.70 inch below the average of the past twenty-two years. During that period the largest monthly rainfall, 6.20 inches fell in 1863; the least, 0.20 inch fell in 1879.

Virginia: Wytheville, monthly rainfall, 2.81 inches, or about 0.89 inch below the April average of eighteen years. During that period the largest April rainfall, 6.50 inches, fell in 1862; the least, 0.80 inch fell in 1876.

West Virginia: Helvetia, monthly rainfall, 4.26 inches, or 0.71 inch above the average of the past six years.

Missouri: St. Louis, Missouri Weather Service reports, rainfall, 4.30 inches, or about the average of the past forty-five years.

SPECIAL HEAVY RAINS.

Fourth, Key West, Fla., 3.23 inches. Little Rock, Arkansas, 1.50 in thirty minutes; Prescott, Arkansas, 7.20. Seventh, Protem, Missouri, 1.64 in three hours; Amité City, Louisiana, 3.32. Seventh and eighth, Corinth, Tennessee, 4.50. Eighth, Brownsville, Tennessee, 6.04; Milan, Tennessee, 5.00; Paris, Tennessee, 3.14. Eleventh, Alexandria, Louisiana, 4.00. Twelfth, Griffin, Georgia, 5.01; Dallas, Texas, 3.31; Monticello, Arkansas, 3.02; Prescott, Arkansas, 7.35. Eighteenth, Vicksburg, 2.43 in six hours; Natchitoches, Louisiana, 2.55. Eighteenth and nineteenth, Mobile, 7.30, of which. 6.70 fell in eight hours. Nineteenth, Amité City, Louisiana, 2.80; Meridian, Mississippi, 2.50. Nineteenth and twentieth, Saint Augustine, Florida, 3.81 in ten hours; Waldo, Florida, 6.86. Twenty-first, Booneville, Missouri, 2.95. Twenty-second, Chattanooga, 2.99; Dalton, Georgia, 2.75; Tuscaloosa, Alabama, 2.70; Arkansas City, Arkansas, 4.03; Monticello, Arkansas, 3.00; Aberdeen, Mississippi, 6.50; Columbus, Mississippi, 2.93; Macon, Mississippi, 2.65; Meridian, Mississippi, 3.20. Twenty-third, Savannah, Georgia, 1.19 in forty-five minutes; West Point, Georgia, 269; Eastman, Tennessee, 3.05; Columbia, Georgia, 2.85. Twenty-seventh, Fort Barrancas, Florida, 3.05 in three hours and forty minutes. Twenty-eighth, Helena, Arkansas, 2.63; Oxford, Kansas, 3.25; Prescott, Arkansas, 3.75. At Walnut Ridge, Arkansas, 6.79 inches fell on the sixth, seventh and eighth.

LARGEST MONTHLY RAINFALLS, INCLUDING MELTED SNOW.

Prescott, Arkansas, 22.18 inches; Alexandria, Louisiana, 12.13; Amité City, Louisiana, 11.71; Aberdeen, Mississippi, 11.24; Mount Washington, 11.20; Sutton, Nebraska, 10.95; Macon, Mississippi, 10.25; Waldo, Florida, 10.22; Mobile, Alabama, 9.92; Brownsville, Tennessee, 9.41; Tuscaloosa, Alabama, 9.41; Meridian, Mississippi,, 9.20; Walnut Ridge, Arkansas, 9.03; Corinth, Tennessee, 9.02; Cheneyville, Louisiana, 8.89; Columbus, Mississippi, 8.52; Okolona, Mississippi, 8.41; State Line, Alabama, 8.31; Natchitoches, Louisiana, 8.20; Green Springs, Alabama, 8.18; Lake, Mississippi, 8.16; Demopolis, Alabama, 8.16; Jackson, Mississppi, 8.14; Griffin, Georgia, 7.84; Clinton, Iowa, 7.40; Calhoun, Georgia, 7.38; Saint Augustine, Florida, 7.27; Monticello, Arkansas, 7.29; Stockham, Nebraska, 7.20; Cedar Bend, Nebraska, 7.19; Fort Barrancas, Florida, 7.08; Grenada, Mississippi, 7.08; Monroe, Louisiana, 7.08; Arkansas City, Arkansas, 7.08; Milford, Nebraska, 6.88; Brook Haven, Mississippi, 6.90; Inavale, Nebraska, 6.80; Fort Canby, Washington Territory, 6.80; Chicago, 6.72; Protem, Missouri, 6.61; West Point, Georgia, 6.54; Fayette, Mississippi, 6.50; Pawnee City, Nebraska, 6.50; Edwards, Mississippi, 6.33; Troy, Alabama, 6.18; Crete, Nebraska, 6.17; New Corydon, Ind., 6.01.

SMALLEST MONTHLY RAINFALL, INCLUDING MELTED SNOW.

Mammoth Tank, Mojave and Indio, California; Texas Hill, Casa Grande, Benson, Wilcox, Yuma, Phœnix' San Carlos and Pantano, Arizona; El Paso, Texas; Lordsburg, New Mexico, and Terrace, Utah, none; Florence, Arizona, trace; La Mesilla, New Mexico and Waco, Texas, 0.01; Camp Thomas, Arizona, 0.02; Fort Verde and San Simon, Arizona, 0.03; Kilton, Utah, and Tucson, Arizona, 0.05; Fort Grant, Arizona, 0.07; Silver City, New Mexico, 0.08; Concho, Texas, 0.09; Stockton, Texas, 0.12; Russelville, Arkansas, 0.14; Fort McDermott, Nevada, 0.14; Concho, Texas, 0.17; Weimar, Texas, 0.20; Coleman City, Texas, and Talladega, Alabama, 0.24; Antioch, California, Palisade and Browns, Nevada, 0.25; Solidad, California, and Sante Fe, New Mexico, 0.26; Prescott, Arizona, 0.28; Carlin, Nevada, 0.30; Promontory, Utah, 0.32; Uvalde, Texas, 0.33; Chualer, California, 0.34; Colusa, California, 0.35; Gainsville, Georgia, and Reno, Nevada, 0.38; Golconda, Nevada, and Fort Wingate, New Mexico, 0.40; Texarkana, Arkansas, 0.42; Corsicana, Texas, 0.44; Cheyenne, Wyoming, 0.46; Annaheim, California, 0.48; Brentwood, California, 0.49; Ticoma, Nevada, Ravenna, California, and Pembina, Dakota, 0.50.

RAINY DAYS.

The number varied in New England from ten to twenty-one; middle Atlantic states, ten to seventeen; south Atlantic states, eight to nineteen; Florida peninsula, eight to thirteen; east Gulf states, eleven to twelve; west Gulf states, six to fourteen; Rio Grande valley, one to five; Ohio valley and Tennessee, ten to sixteen; lower lake region, ten to sixteen; upper lake region, eight to eighteen; extreme northwest, eight to thirteen; upper Mississippi valley, nine to fourteen; Missouri valley, ten to sixteen; northern slope, eight to fifteen; middle slope, six to fifteen; southern slope, zero to eight; southern plateau, zero to seven; middle plateau, ten to fourteen; northern plateau, seven to sixteen; north Pacific coast region, eighteen to twenty-one middle Pacific coast region, eight to nine; South Pacific coast region, zero to eight.

CLOUDY DAYS.

The number varied in New England from five to fourteen; middle Atlantic states, eight to fourteen; south Atlantic states, six to twelve; Florida peninsula, four to six; east Gulf states, six to eleven; west Gulf states, five to fifteen; Rio Grande valley, six to thirteen; Ohio valley and Tennessee, seven to twelve; lower lake region, nine to fourteen; upper lake region, five to twelve; extreme northwest, five to twelve; upper Mississippi valley, six to thirteen; Missouri valley, nine to sixteen; northern slope, six to thirteen; middle slope, two to eight; southern slope, zero to seven; southern plateau, zero to four; middle plateau, four to twelve; northern plateau, six to ten; north Pacific coast region, fourteen to sixteen; middle Pacific coast region, three to eight; south Pacific coast region, one to six.

SNOW.

The dates on which snow fell in the various districts, are as follows:

New England, 1st to 4th, 6th to 15th, 18th to 25th, 27th to 29th.

Middle Atlantic states, 9th to 12th, 21st to 24th.
Ohio valley, 10th, 11th, 15th, 19th, 22d, 26th.
Lower lake region, 1st, 10th to 12th, 14th to 16th, 21st.
Upper lake region, 2d, 9th to 14th, 19th to 21th, 23d, 26th to 30th.
Upper Mississippi valley, 1st, 3d, 8th to 12th, 18th, 19th.
Missouri valley, 11th to 13th, 22d.
Extreme northwest, 5th, 6th 9th, 13th, 22d.
Northern slope, 4th to 29th.
Middle slope, 3d, 4th, 7th, 8th, 10th to 14th, 16th, 17th, 21st, 27th to 30th.
Southern plateau, 5th, 7th, 10th, 12th to 14th, 17th, 20th to 22d.
Middle plateau, 3d to 6th, 9th to 11th, 15th to 17th, 20th, 22d to 23d.
Northern plateau, 10th, 16th, 19th, 20th, 22d to 24th, 26th, 27th.
North Pacific coast region, 6th, 20th, 23d.

Lynchburg, Virginia, 23d. The Blue Ridge mountains, twenty miles distant are partly covered with snow. Burlington, Vermont, 29th. The summits of the Adirondacks, (notably Mount Marcy) and of Green mountains are covered with snow. In a sheltered place, twenty feet from Signal office, snow remains to a depth of four feet.

LARGEST MONTHLY SNOW FALL.

Mount Washington, 66 inches; Cisco, California, 56; Summit, California, 32 5; Emigrant Gap, California, 26; Turkee, Nevada, 18.5; Pike's Peak, Colorado, 18; Blackfeet Agency, Montana, 17.6; Wells, Nevada, 13; Otego, Nevada, 12; Eastport, Maine, and Boca, Nevada, 10; Stratford, Vermont, and Orono, Maine, 9; Lunenburg, Vermont, and Hermosa, California, 8.5; Bloominggrove, Pennsylvania, 8; Alta, California, Elko, Nevada, Port Jervis, New York, and Beowawa, Nevada, 6.

DEPTH OF SNOW ON GROUND AT END OF MONTH.

Colorado: Pike's Peak, eighteen inches.
Maine: Eastport, ten inches.
New Hampshire: Mount Washington, sixty-six inches.

HAIL.

Eastport, 2d. Manasquan, New Jersey, 2d. Lynchburg, Virginia, 27th. Delaware Breakwater, Delaware, 23d. Philadelphia, 19th. Washington, District of Columbia, 22d. Atlanta, 3d. Augusta, 9th, 22d. Mobile, 11th. Palestine, Texas, 11th, 8.04 p. m., heavy rain and hail storm continuing until 8.18 p. m.; stones measured three-eighths of an inch in diameter. Considerable damage was done to fruit and growing crops. The storm is considered by residents to have been one of the severest ever experienced at this place. The damage to buildings, crops, etc., is estimated at about $175.000. Dennison, Texas, 22d. Fort Gibson, Indian territory, 22d. Shreveport, 21st. Palestine, Texas, 28th. Little Rock, Arkansas, 11th. Indianola, Texas, 12th, severe hail storm reported from Texona, Jackson county, destroying potatoes, melons and other vegetables. In one place a field of corn nearly waist-high was completely destroyed for a mile square. On 14th, hail was reported to have fallen twenty miles north of station, and on the 16th hail fell at this station. Port Eads, Louisiana, 13th. Fort Concho, Texas, 7th, 8.55 p. m., hail measuring half inch in diameter. Nashville, 12th. Cincinnati, 10th, 26th. On the latter date between 4.48 and 4.53 p. m., hail fell rapidly; stones measured half inch in diameter; in some instances breaking window glass. Memphis, 11th. Cleveland, 19th. Rochester, 2d, 28th. Chicago, 6th. Madison, Wisconsin, 1st. Cairo, 22d. Saint Louis, 22d. Springfield, Illinois, 6th. Omaha, 7th. Leavenworth, 11th, 18th, 21st. Huron, Dakota, 8th. Springfield, Missouri, 22d. Fort Bennett, Dakota, 25th. Deer Lodge, Montana, 15th, 19th, 20th. Rapid City, Dakota, 4th, 7th. North Platte, 7th, severe storm, accompanied by hail, which at first was small, but soon large egg-shaped and spherical stones fell, their average diameter being about one and one-fourth inches. Dodge City, Kansas, 5th. Grierson Springs, Texas, 7th, 4. 30 p. m., severe hail storm, accompanied by thunder and lightning; stones weighing from one to two ounces. Henrietta, Texas, 21st, severe hail storm reported from section about thirty miles east of station. Silver City, New Mexico, 13th. Helena, Montana, 19th. Fort Missoula, Montana, 20th. Umatilla, Oregon, 19th. Spokane Falls, Washington territory, 26th. Colfax, Washington territory, 15th. Boise City, Idaho, 22d. Fort Lapwai, Idaho, 19th, 25th. Dayton, Washington territory, 23d, 25th. Red Bluff, California, 10th. Olympia, Washington territory, 20th, 25th. Fort Hale, Dakota, 7th, 8th. Fort McDermitt, Nevada, 6th, 9th, 10th. Fort Niagara, New York, 28th. Fort Concho, Texas, 7th. Camp near Presidio, Texas, 1st. Fort Douglas, Utah, 23d. Fort Canby, Washington territory 20th, 23d to 26th. Olivet, Dakota, 29th. Alexandria, Dakota, 7th, 21st. Charleston, Illinois, 26th. Spiceland, Indiana, 26th. Vevay, Indiana, 10th. Rising Sun and Lafayette, Indiana, 10th. Cresco, Iowa, 3d, 9th, 21st. Nora Springs and Cedar Rapids, Iowa, 25th. Dana, Iowa, 8th. Holton, Kansas, 3d. Independence, Kansas, 11th, 21st. Yates Centre, Kansas, 8th, 18th, 21st. Clay Centre, Kansas, 11th, Creswell, Kansas, 17th. Cornish and Gardiner, Maine, 7th. Fallston, Maryland, 19th. Owing's Mills, Maryland, 20th. Federalsburg, Maryland, 23d. Woodstock, Maryland, 10th. Westborough, Massachusetts, 7th. Litchfield, Michigan, 26th, 27th. Fayette, Mississippi, 10th, 11th, on latter date, hail-stones were very large, injuring gardens and cotton-crop in some localities. Northfield, Minnesota, 3rd, 18th, 26th. Protem, Missouri, 8th 11th, 22nd. Blackfeet Agency, Montana, 24th. De Sota, Nebraska, 21st. Genoa, Nebraska, 7th. Acto and Moorestown, New Jersey, 19th. Freehold, New Jersey, 26th. Ithaca, New York, 6th. Waterburg, New York, 7th, 27th. White Plains, New York, 22d. Portsmouth and College Hill, Ohio, 26th. New Athens, Ohio, 22d. Fallsington, Pennsylvania, 2d, 19th. West Chester and Meadville, Pennsylvania, 19th. Dallas, Texas, 11th, 5:10 p. m., severest hail-storm, with largest hail ever known at this place' Stateburg, South Carolina, 22d. Clarkesville, Texas, 28th' Woodstock, Vermont, 2d. Wytheville, Virginia, 4th, 26th' Manitowoc, Wisconsin, 1st. Beloit, Wisconsin, 25th. Embarras, Wisconsin, 29th.

SLEET.

Sleet was reported by the following stations: Bangor, Maine, 13th; Mount Washington, New Hampshire, 4th, 7th, 8th; Boston, 27th, 28th; Washington, 10th, 13th, 23d; Erie, Pennsylvania, 9th; Knoxville, Tennessee, 12th; Nashville, Tennessee, 13th; Vevay, Indiana, 10th, 25th; Spiceland, Indiana, 10th; New Athens, Ohio, 22d; Chicago, 23d; Milwaukee, 10th; Dubuque, Iowa, 10th, 22d, 23d; Saint Paul, 22d; Fort Snelling, Minnesota, 8th; Leavenworth, Kansas, 11th, 12th; Holton, Kansas, 11th; Omaha, Nebraska, 7th; North Platte, Nebraska, 11th; Fort Bennett, Dakota, 7th; Huron, Dakota, 22d; Tobacco Garden, Dakota, 7th, 8th, 9th; Cheyenne, Wyoming Territory, 4th; Pike's Peak, 27th, 28th, 30th; Fort Garland, Colorado, 21st; Fort Stanton, New Mexico, 16th; Florence, Arizona, 29th; Henrietta, Texas, 13th; Fort Washakie, Wyoming, 17th, 20th; Salt Lake City, 10th; Fort Benton, Montana, 10th, 16th; Dayton, Washington territory, 20th.

COTTON REGION REPORT.

Arrangements have been made with the co-operation of the rail-road and telegraph lines, in the southern states, to the end that daily reports of the rain-fall, maximum and minimum temperatures may be collected, and the results published throughout the commercial centers of the cotton region, from April first to October thirty-first, inclusive.

The accompanying chart exhibits the arrangements of stations and districts, and the rail-road system of the cotton regions. This system of reports was successfully begun on the first

of April and continued during the month. The following table gives the average rain-fall, mean of the maximum, and the mean of the minimum temperatures in each district:

Meteorological Record for the Cotton Districts for the month of April, 1882.

DISTRICTS.	Average rain-fall in inches.	Mean of the maximum.	Mean of the minimum.
New Orleans	5.63	81.9	59.9
Savannah	3.73	81.1	60.2
Charleston	2.68	77.5	54.5
Atlanta	4.49	76.3	54.9
Wilmington	3.88	74.2	50.0
Memphis	5.29	74.9	54.0
Galveston	1.58	82.1	57.9
Vicksburgh	7.03	78.6	56.8
Montgomery	4.92	78.5	57.2
Augusta	3.05	78.2	54.7
Little Rock	4.74	75.9	51.9
Mobile	8.80	79.1	57.3

This being the first REVIEW in which reference is made to this important feature of Signal Service reports, the following list of stations is given, showing the extent of each district in the cotton region from which the full signification of the means and averages of the above table may be determined. It will be seen that the districts embrace the territory adjacent to the more important cities where Signal Service stations are located:

Cotton Region Districts.

Districts and Centers.	STATIONS.	
	Where.	On what Railroad.
Savannah.	Cedar Keys, Fla.	Atlantic, Gulf and West India Transit. These reports are concentrated at Cedar Keys and telegraphed to Savannah, Ga.
	Fernandina, Fla.	
	Waldo, Fla.	
	Jesup, Ga.	Savannah, Florida & Western.
	Way Cross, Ga.	
	Live Oak, Fla.	
	Quitman, Ga.	
	Thomasville, Ga.	
	Bainbridge, Ga.	
	Albany, Ga.	
	Smithville, Ga	South Western.
	Fort Gaines, Ga.	
	Millen, Ga.	Central of Georgia.
	Allapaha, Ga.	Brunswick and Albany.
	Eastman, Ga.	Macon and Brunswick.
Charleston.	Jacksonborough, S. C.	Charleston and Savannah.
	Yemassee, S. C.	
	Hardeeville, S. C.	
	Georges, S. C.	South Carolina.
	Branchville, S. C.	
	Saint Mathew's S. C.	
	Kingstree, S. C.	North-Eastern.
Wilmington.	Weldon, N. C.	Wilmington and Weldon.
	Goldsborough, N. C.	
	Lumberton, N. C.	Carolina Central.
	Wadesborough, N. C.	
	Charlotte, N. C.	
	Salisbury, N. C.	Richmond and Danville Line.
	Cheraw, S. C.	Cheraw and Darlington.
	Florence, S. C.	Wilmington, Columbia, and Augusta.
Augusta.	Chester, S. C.	Charlotte, Columbia, and Augusta.
	Columbia, S. C.	
	Allendale, S. C.	Port Royal and Augusta.
	Macon, Ga.	Georgia.
	Columbus, Ga.	South-Western.
	Athens, Ga.	Georgia.
	Covington, Ga.	
	Madison, Ga.	
	Union Point, Ga.	
Atlanta.	Newman, Ga.	Atlanta and West Point.
	West Point, Ga.	
	Gainesville, Ga.	Richmond and Danville Line.
	Tocoa, Ga.	
	Spartanburgh, S. C.	

Cotton Region Districts.—Continued.

Districts and Centers.	STATIONS.	
	Where.	On what railroad.
Atlanta.	Cartersville, Ga.	Western and Atlantic.
	Calhoun, Ga.	
	Dalton, Ga.	
	Griffin, Ga.	Central of Georgia.
Montgomery.	Opelika, Ala.	Western of Alabama.
	Troy, Ala.	Mobile and Girard.
	Greenville, Ala.	Mobile and Montgomery.
	Pine Apple, Ala.	Pensacola and Selma.
	Uniontown, Ala.	Alabama Central.
	Demopolis, Ala.	
	Tuscaloosa, Ala.	Alabama Great Southern.
	Selma, Ala.	Louisville and Nashville.
	Birmingham, Ala.	
	Calera, Ala.	
	Talladega, Ala.	Selma Division, East Tennessee Virginia and Georgia.
Mobile.	State Line, Ala.	Mobile and Ohio.
	Waynesborough. Miss.	
	Meridian, Miss.	
	Macon, Miss.	
	Columbus, Miss.	
	Aberdeen, Miss.	
	Okolona, Miss.	
New Orleans.	Scranton, Miss.	Louisville and Nashville.
	Pass Christian, Miss.	
	Brookhaven, Miss.	Chicago, Saint Louis and New Orleans,
	Amité City, La.	
	Terre Bonne, La.	
	Morgan City, La.	
	Franklin, La.	Morgan's Louisiana and Texas.
	New Iberia, La.	
	Vermillionville, La.	
	Whiteville, La.	
	Cheneyville, La.	
	Alexandria, La.	
	Natchitoches, La.	Merchants' Union Telegraph line, connecting with Western Union lines at Minden.
	Coushatta, La.	
	Minden, La.	
Galveston.	Orange, Texas	Texas and New Orleans.
	Beaumont, Texas.	
	Houston, Texas.	Houston and Texas Central.
	Hempstead, Texas.	
	Hearne, Texas.	
	Corsicana, Texas.	
	Waco, Texas.	
	Dallas, Texas.	
	Huntsville, Texas.	International and Great Northern.
	Palestine, Texas.	
	Longview, Texas.	
	Tyler, Texas.	
	Austin, Texas.	
	Belton, Texas.	Gulf, Colorado, and Santa Fé
	Weimar, Texas.	Galveston, Harrisburgh, and San Antonio.
	Luling, Texas.	
	San Antonio, Texas.	
	Weatherford, Texas.	Texas and Pacific.
Little Rock.	Paris, Texas.	Texas and Pacific.
	Texarkana, Ark.	Saint Louis, Iron Mountain and Southern.
	Prescott, Ark.	
	Malvern Junction, Ark.	
	Kensett, Ark.	
	Walnut Ridge, Ark.	
	Brinkley, Ark.	Memphis and Little Rock.
	Madison, Ark.	
	De Vall's Bluff, Ark.	
	Russellville, Ark.	Little Rock and Fort Smith.
	Fort Smith, Ark.	
	Arkansas City, Ark.	Little Rock, Mississippi River, and Texas.
	Monticello, Ark.	
Vicksburg.	Edwards, Miss.	Vicksburgh and Meridian.
	Jackson, Miss.	
	Lake, Miss.	
	Monroe, La.	Vicksburg, Shreveport and Pacific.

Cotton Region Districts.—Continued.

Districts and Centers.	Stations.	
	Where.	On what railroad.
Memphis.	Grand Junction, Tenn.	Memphis and Charleston.
	Corinth, Tenn.	
	Tuscumbia, Ala.	
	Decatur, Ala.	
	Scottsborough, Ala.	
	Withe, Tenn.	Louisville and Nashville.
	Brownsville, Tenn.	
	Milan, Tenn.	
	Paris, Tenn.	
	Erin, Tenn.	
	Clarksville, Tenn.	
	Nashville, Tenn.	Nashville, Chattanooga and Saint Louis.
	Hernando, Miss.	Mississippi and Tennessee.
	Batesville, Miss.	
	Grenada, Miss.	

RELATIVE HUMIDITY.

The mean relative humidity for the month ranges as follows in the several districts:

New England, from 57 to 76; middle Atlantic states, 53 to 75; south Atlantic states, 66 to 81; Florida peninsula, 71 to 74; east Gulf states, 67 to 78; west Gulf states, 63 to 83; Rio Grande valley, 57 to 82; Ohio valley and Tennessee, 57 to 66; lower lake region, 64 to 72; upper lake region, 67 to 77; extreme northwest, 74 to 80; upper Mississippi valley, 55 to 71; Missouri valley, 62 to 70; northern slope, 61 to 66; middle slope, 44 to 60; southern slope, 33 to 66; southern plateau, 30 to 37; middle plateau, 43 to 53; northern plateau, 53 to 75; north Pacific coast region, 70 to 76; Middle Pacific coast region, 59 to 73; south Pacific coast region, 36 to 74. High stations report the following percentages not corrected for altitude: Cheyenne, Wyoming, 49.6; Pike's Peak, 83.0; Santa Fé, 36.6; Mt. Washington, 86.6.

WINDS.

The prevailing winds during the month of April at Signal Service stations are shown on chart number ii by arrows flying with the wind:

On the New England and middle Atlantic coasts the winds are northwest to southwest. In the south Atlantic states, from southeast to southwest, except at Hatteras, Kittyhawk and Norfolk, where they are northeasterly. In the Gulf states, Indian territory, Tennessee, and Kansas, southerly winds prevail, while in the Ohio, upper Missouri and Mississippi valleys, the winds are generally from north to east. South to west winds prevail on the north Pacific coast, and west to northwest in northern California. In the plateau regions the winds are generally from south to west.

TOTAL MOVEMENTS OF THE AIR.

The following are the largest total movements at Signal Service stations: Mount Washington, 22,005 miles; Pike's Peak, 16,938; Hatteras, North Carolina, 12,935; Portsmouth, North Carolina, 12,702; Kittyhawk, North Carolina, 11,854; New Shoreham, Rhode Island, 11,552; Indianola, Texas, 11,098; Sandusky, 11,093; Dodge City, Kansas, 11,109; Fort Elliott, Texas, 10,712; Sandy Hook, New Jersey, 10,305; Champaign, Illinois, 10,057; Bismarck, Dakota, 10,035; Huron, Dakota, 10,010; Cape Henry, Virginia, 9,757; Barnegat, New Jersey, 9,680; Milwaukee, Wisconsin, 9,646; Grand Haven, Michigan, 9,580; Galveston, Texas, 9,551; Cape May, New Jersey, 9,432; North Platte, Nebraska, 9,412; West Las Animas, Colorado, 9,344; Moorhead, Minnesota, 9,286; Macon, North Carolina, 9,204; Fort Keogh, 9,163; Rochester, 9,106; Port Eads, Louisiana, 9,040; Yankton, Dakota, 9,032; Henrietta, Texas, 9,016; Eagle Rock, Idaho, 8,702; Punta Rassa, 8,632; Madison, Wisconsin, 8,613; Concho, Texas, 8,363; Oswego, New York, 8,267; Boston, Massachusetts, 8,239; Detroit, Michigan, 8,072; Santa Fe, New Mexico, 8,068; Chincoteague, Virginia, 8,035; Port Huron, Michigan, 8,003. The smallest are: Lynchburg, Virginia, 2,676; Lewiston, Idaho, 2,692; Augusta, Georgia, 2,739; Los Angeles, California, 2,786; Florence, Arizona, 2,947.

HIGH WINDS.

On the summit of Mount Washington the maximum velocity, 120 miles, n.w., on 22d. Velocities of 100 miles, n.w., occurred on the 2d, 13th and 18th. Velocities of 50 miles, or over, occurred as follows: 92 miles, n.w., 17th; 90, n.w., 4th; 86, n.w., 16th; 81, n.w., 7th; 80, n.w., 8th; 75, n.w., 21st; 68, s.w., 1st; 68, n.w., 30th; 66, n.w., 23d; 60, n.w., 12th and 20th; 60, s.e., 19th; 58, n.w., 5th; 55, n.w., 29th; 52, n.w., 14th; 50, n.w., 9th.

On the summit of Pike's Peak, Colorado, the maximum velocity, 64 miles, s.w., occurred on the 25th; other high velocities occurred as follows: 60 miles, s.w., on the 20th and 24th; 58, s.w., 3d; 56, n.w., 8th; 52, s.w., 23d; 50, s.w., 19th.

Other stations reporting velocities of 50 miles per hour, or over, are as follows: Eagle Rock, Idaho, 55 miles, s.w., 19th; Fort Keogh, 50, w., 26th; Dodge City, Kansas, 52, s., 17th; Palestine, Texas, 50, w., 22d; Toledo, 50, e., 23d; Kittyhawk, North Carolina, 51, w., 10th; Hatteras, North Carolina, 56, n.e., 10th; Portsmouth, North Carolina, 66, n.e., 10th, 52, s.w., 23d.

LOCAL STORMS.

Palestine, Texas, 22d, violent storm; wind reaching maximum velocity of fifty miles; much damage done in this city to fences, buildings, etc. Sandusky, Ohio, 23d, destructive gale, reaching its height at 2:15 a. m. The schooner "Gallatin," while off Cleveland, sprung a leak and the high wind caused her to fill rapidly. She became unmanagable and went ashore on Chickanola reef and sank. During the gale there were thirty vessels sheltered at Kelly's Island; all of them were more or less damaged. At Marblehead, seven docks were washed away. The damage by this storm, to fishing interests was very great.

Topeka, Kansas, 6th, during evening, a tornado started near Raymond in Rice county, moved in a northerly direction and prostrated the telegraph poles, when it crossed the Santa Fe railroad track. In this neighborhood several buildings were demolished, one person was killed and another fatally injured. Proceeding northward the storm struck the town of Chase, demolishing twenty out of thirty-six buildings and threw railroad cars from the track; three persons were killed and one fatally injured. At the same time another small tornado passed through the eastern part of the county, but did but little damage. In some places the wind sucked all of the water out of wells. As the storm-cloud approached Chase it was of funnel-shape, whistling and twisting with great velocity. Many of the inhabitants are more or less injured, but few escaping without hurt of some kind. The people are living in box-cars and many families are in destitute conditions.

At Strafford, Kansas, a village of about eighty houses, about two hundred miles southwest of Topeka, all but two houses were blown down; one man was killed and several persons were, more or less, injured. Reports from Keosauqua, say great damage was done throughout the lower Des Moines valley. At Keosauqua one house was demolished and several others injured; tress and fences blown down in all directions. At Ashton, Missouri, same date, a tornado did great damage; four houses were demolished and others suffered loss of chimneys and roofs.

Detroit, 6th, between Clyde and Highland, near the Flint and Pere Marquette railway, about forty miles from Detroit, about 8 p. m., a violent tornado occurred; houses were destroyed and a number of lives were lost. In Alamo township, Kalamazoo county, houses and barnes were unroofed, two persons were killed and another injured. The storm struck this section between 5 and 6 p. m., and moved eastward across the northern part of the country.

At Otsego, Allegan county, Michigan, the storm was very

severe and was accompanied by hail and vivid lightning. From the westward of this place, the storm could be distinctly seen curveting in the sky. After leaving Allegan and Kalamazoo counties, the storm passed across the northwest corner of Calhoun county, and across the southern part of Barry county, where in the latter it struck near Hickory Corners, in Johnstown township about five-thirty p. m., and was accompanied by the heaviest hail ever known in that section; doing great damage to orchards and breaking windows. Its course was from west to east and every thing in its track was demolished. The width of track where the greatest damage was done, is from forty to fifty rods. Inside this expanse it cleared everything, leaving a course as decidedly marked as the path of a reaper through a field of grain. Outside the immediate path, the damage was slight on either side; and at a quarter of a mile distant no damage was done. A number of dwellings, barns and other buildings were blown down or unroofed. Several persons were injured.

At Bedford Centre, Calhoun county, the tornado was seen in a northerly direction. in the form of a funnel-shaped cloud with the vortex downward, moving to the northeast, and seemed to lower itself to the earth, again ascend and move onward in the upper regions. It passed through the township of Kalamo, Eaton county, within a mile of Charlotte, sweeping everything in its path, which was from four to twenty rods in width. The largest trees were twisted off from four to thirty feet from the ground and carried considerable distances. A number of dwellings were totally destroyed, together with numerous other buildings. Several lives were lost and many persons injured. Many persons, seeing its approach, took refuge in their cellars and thus escaped bodily injury. The damage at this place is estimated at one hundred thousand dollars. In this vicinity the tornado was accompanied by hail sufficiently large to break windows.

In Ingham county the tornado struck the southeasteru corner in the northern part of White Oak township, accompanied by hail and thunder. Several houses were totally destroyed; one man was instantly killed by a piece of timber; a number of sheep were killed by falling timbers of the barn in which they were sheltered. A pond near the barn, in which the water was several feet deep, was emptied of all the water. In Livingston county no damage has been reported.

A 5 p. m., Mount Pleasant, Isabel county, was struck by a severe hail storm; some of the stones were an inch and a half in diameter; one was picked up that measured six inches in circumference. In Midland county, several dwellings, barns and other buildings were destroyed; one person killed and several injured. Its course was in an easterly direction, and its path not more than one-quarter of a mile wide. The tornado struck Bay county about 6 p. m., causing great distruction in the townships of Williams, Beaver and Kawkawlin. In Angres township the damage was less serious. It passed through three miles of timber and scarcely left a tree standing.

Port Huron Michigan, 9th., 12 m., during gale a sail-boat was capsized and sunk. Cairo, Illinois, 22d, abont 4.40 p. m., a violent tornado struck this city. It first struck this vicinity near Charleston, Missouri, about twelve miles south-southwest of Cairo, where fences were blown down and trees uprooted for a distance of about one and a-half miles in length and three-fourths of a mile in width. Its first appearance was in the northern part of the city. Its path over the city was about one mile wide. In the northern part of the city, four empty freight cars were blown from the track; many houses were unroofed, chimneys and trees blown down. Two hundred feet of wooden sidewalk was lifted and carried a distance of one hundred feet. In another place thirty feet of heavy oak sidewalk, twenty feet in width, was taken up and carried a distance of sixty feet, breaking down a telegraph pole in its course. A large gas-holder, sixty feet in diameter, was struck and overturned, the heavy iron columns supporting the tank were torn off and broken. Persons and animals were taken up and carried considerable distances. The damage done in Cairo is estimated at $30,000.

In east Cairo, Kentucky, a transfer building, three hundred feet long, was completely demolished. Beyond this place the tornado lifted from the earth and continued its north-northeasterly course, descending at a point about five miles distant, where it swept over a farm blowing down and uprooting large trees, demolishing fences, etc. From this place it again ascended and not strike the earth until it reached a point a little west of Carmi, Illinois, where it was very destructive. In this vicinity a double log house was totally demolished; other houses and out-buildings were blown down or unroofed; orchards and many miles of fencing were destroyed. No damage was done in Carmi.

Springfield, Illinois, 6th, severe storm of rain, hail, and thunder; several barns in vicinity were unroofed or blown down together with trees, fences, signs, etc: No damage was done in the centre of the city.

Smithville, Dakota, 21st, very heavy, rain and snow storm accompanied by high wind. Fifteen miles of telegraph line between Smithville and Rapid City were prostrated.

Dodge City, Kansas, 6th, reports from Lyon, a small town about one hundred miles east of this city, say that the town was nearly destroyed by a tornado on the 5th instant. Two persons are reported to have been killed.

Dana, Iowa, 8th, about five p. m. a tornado passed near station, accompanied by rain and hail, destroying buildings and doing other damage.

Savannah, Georgia, 24th, a tornado of destructive force occurred near Macon, Georgia, on night of 23d instant; several lives were lost and considerable property destroyed.

Evergreen, Indiana, 19th, about twelve thirty a. m. a destructive tornado visited this place, seventeen buildings were destroyed, many others injured. The damage in Evergreen is estimated at thirty-five thousand dollars.

The observer at Des Moines sends the following report of the tornado which originated opposite Sheldahl, Iowa, on the evening of the eighth and moved in a northerly direction, passing about one mile north of Ames, Iowa: "The average width of path was about 300 feet, and its length about 12 miles. A number of buildings in its path were destroyed; the Agricultural college was unroofed, trees were torn up by the roots, and fences and light buildings were blown away."

New Orleans, 18th.—During the evening a severe tornado visited the southern part of this parish. In the city proper, except a few signs that were blown down and a few limbs blown from the trees, but little damage was done. At Carollton, at 6.30 p. m., it could be seen coming in a northwesterly direction from a point about a mile distant on the other side of the river. In an instant it struck the river, raising from it a quivering column of water sixty feet high. It struck the ferry-wharf, lifting it from the river and landing it some distance on the bank in a demolished condition. Many dwellings were blown down or unroofed; several persons were injured by falling timbers. The damage to property is estimated at $25,000.

Morgan City, Louisiana.—During the night of the 13th this section was visited by a most terrible storm, causing the water to rise and destroying an immense amount of property. The Ramos railroad bridge was carried away, and at Drew's Mills about twenty dwellings were destroyed; only one house remained standing. Along Bayou Teche cabins and other small buildings were destroyed on every plantation. In Berwich a school house was blown from its foundation and two men killed by the falling timber. Many persons narrowly escaped drowning. The destruction of live-stock throughout a large section of country is very great. A sugar house in Saint Charles parish was blown down and a man killed. At Fausse Point forty houses were swept away, and the loss of stock, crops, etc., is enormous.

On the 19th a terrible tornado struck Brownsville, Missouri, completely destroying a large part of the town. Eleven persons were killed and one hundred and fifty injured. Over fifty houses in the heart of the town were demolished. The

storm struck the town at 4 p. m.; large two-story brick buildings were lifted from their foundations and the ruins scattered in all directions; frame dwellings were overturned and crushed into splinters; large trees were uprooted and carried long distances; and animals were picked up, carried various distances, and dropped lifeless along the path of the storm. Just before the funnel-shaped cloud struck the town, a loud roaring noise was heard, which was followed by several loud electrical explosions. The funnel-shaped mass had a rapid rotary motion, drawing within its vortex everything with which it came in contact. The storm-track was about two hundred yards wide, with a zigzag course from southwest to northeast.

At Renick, Randolph county, about 6 p. m., sixty miles northeast of Brownsville, a tornado exhibited considerable violence, which was attended by a whirling motion.

At Montrose, Henry county, 4.10 p. m., a violent tornado did much damage.

In Reynolds county, Missouri, on the 8th, at 6 p. m., a small tornado, about one hundred yards wide, swept everything clean in its path. The same locality was visited by the memorable tornado of 1850.

Pennsville, Pennsylvania, on the 19th: a severe storm burst suddenly on this community about 4 p. m.; it was of short duration and very limited in its track. It moved from southwest to northeast, passing over the northern part of Fayette county. The destruction by this tornado has never before been equalled by any like occurrence Buildings were demolished or unroofed; chimneys, fences and trees blown down; and a number of persons were injured, some of whom have since died.

New Orleans, April 22d, a tornado swept across the Chicago, Saint Louis and New Orleans railroad, between Summit and Bayou Chitto, Mississippi, prostrating telegraph poles on both sides of the track for a distance of one mile and uprooting trees, many of them falling across the railroad.

Monticello, a town twenty miles east of Brookhaven at 12:15 p. m., was nearly destroyed—only three houses, on the outskirts, being left. Nothing before has ever been experienced, like this, at this place. Ten persons were killed instantly. Out of a population of one hundred and fifty, very few escaped without injury. A fine residence, four miles west of Monticello, was entirely destroyed.

Natchez, Mississippi, 19th, about nine p. m., a storm of great severity burst upon the city, continuing for a few minutes, during which time it wrecked buildings, uprooted trees, prostrated fences and tore signs from their fastenings, while the accompanying rain deluged cellars, doing an incalcuable amount of damage. Great damage was done to fruit and spring vegetables by the hail. The course of the storm was from northwest to southeast.

Abilene, Kansas, 7th, heavy rain and wind storm doing considerable damage in the eastern and southwestern parts of Dickinson counties.

At Chapman, a church was demolished; roofs of several houses were blown off; barns and other buildings damaged.

At Woodbine, a church, three buildings and a blacksmith shop were demolished.

On Holland creek, eighteen miles southwest from Abilene, considerable damage was done. This storm struck the counties at the southwest corner and traveled in a northeasterly course.

On the same date, at Rosalia township, in Butler county, Kansas, 10.30 p. m., three houses were overturned, one man killed and several persons injured. The storm was from southwest to northeast.

Junction City, Kansas.—About midnight a tornado passed over this neighborhood from the southwest which was very destructive.

At Fort Riley, Kansas, most of the buildings were unroofed and a portion of the walls destroyed, involving a loss of from $25,000 to $30,000. At Wakefield, Clay county, eight houses were destroyed. In all parts of the county, barns, outhouses and fences were destroyed.

Maysville, Kentucky, 28.—A tornado has caused great destruction on Tuckehoe ridge; several large tobacco houses were blown down and their contents scattered. At Lawrence, a brick church was unroofed and one end blown in; a schoolhouse, two dwellings and a number of barns and out-buildings were destroyed. The storm was the most violent ever known in this section.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for April, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.9 per cent. The percentages for the four elements are: Weather, 87.4; Direction of the Wind, 88.1; Temperature, 84.1; Barometer, 79.1 per cent. By geographical districts they are: For New England, 82.6; middle Atlantic states, 85.0; south Atlantic states, 84.4; east Gulf states, 87.4; west Gulf states, 86.0; lower lake region, 86.2; upper lake region, 83.8; Tennessee and the Ohio valley, 83.1; upper Mississippi valley, 83.9; lower Missouri valley, 84.1; northern Pacific coast region, 94.1; middle Pacific coast region, 78.0; southern Pacific coast region, 98.6

There were 96 omissions to predict (38 being due to the absence of reports from the Pacific coast) out of 3,690, or 2.33 per cent. Of the 3,594 predictions that have been made, 98, or 2.73 per cent., are considered to have entirely failed; 102, or 2.84 per cent., were one-fourth verified; 397, or 11.04 per cent., were one-half verified; 673, or 18.73 per cent., were three-fourths verified; 2,324, or 64.66 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

CAUTIONARY SIGNALS.

One hundred and ninety-five cautionary signals were displayed during the month of April, of which one hundred and sixty-eight, or 86.1 per cent., were justified by winds of twenty-five miles per hour, at, or within, one hundred miles of the station. Thirteen "off-shore" signals were displayed, of which nine, or 69.2 per cent., were fully justified; twelve, or 92 per cent., were justified as to velocity; and ten or 76.9 per cent., were justified as to direction; Of all kinds displayed, there were two hundred and eight, of which one hundred and seventy-seven, or 85.1 per cent., were justified. Thirteen cautionary signals were changed to "off-shore" signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right hand of chart number iii., are given the highest and lowest stages of water observed at Signal Service stations during the month of April. At stations in the lower Mississippi it will be seen that the water has fallen from the first of the month, when it was above the danger-line at Cairo and Vicksburg, and only five inches below the danger-line at Memphis. At the close of the month it had fallen at all stations south of Cairo, but remained two feet above the danger-line at Vicksburg. At stations in the upper Mississippi the highest water occurred between the twentieth and thirtieth. On the twenty-fifth, at Keokuk, it was two feet and two inches above the danger-line, or sixteen feet eight inches on the gauge. The lower Missouri reached its maximum about the tenth of the month, and was at its minimum height from the third to fifth. The Ohio was highest at Pittsburg on the twenty-eighth, and highest at Louisville and Cincinnati from the first to the third of the month.

ICE IN RIVERS AND HARBORS.

Lake Champlain: Burlington, Vermont, 5th, steamer "Williams" left this port for Plattsburg, New York, but was unable

to enter harbor on account of ice. Sixth, during morning lake frozen over inside Breakwater, and also a portion of Broad lake. Seventh, ice passed out of harbor during morning but remained in portions of lake. Twenty-ninth, heavy ice on lake shore.

Penobscot river: Bangor, Maine, 8th, ice rapidly breaking. Ninth, ice moving out of river. Tenth, river open to navigation; first arrival.

Lake Superior: Marquette, 13th, ice cleared from around the docks. Duluth, Minnesota, 8th, large field of ice was blown into this end of lake during storm. Twenty-third, barge "N. K. Fairbanks" arrived from Buffalo; first arrival from lower lakes. Twenty-eighth, ice nearly all driven out of lake by northwest wind. Ashland, Wisconsin, 27th, navigation opened.

Missouri river: Ft. Yates, Dakota, 1st, ice broke up quietly and began running out at 8 a. m. Sixteenth, first boat arrived. Nineteenth, first boat departed. Bismarck, 3d, ice breaking in river below bridge, but is closed above. Fifth, ice broke up and moved out at 8.45 a. m. Fort Stevenson, Dakota, 12th, first arrival of season. Yankton, Dakota, 2d, ferry boat "New Ella," from Sioux City, arrived; first of season. Ninth, navigation fully opened; steamer "Big Horn" for Bismarck passed upward to-day.

Red River of the North: Moorhead, Minnesota, 14th, river clear of ice. Nineteenth, navigation opened; steamer "J. L. Grandin" departed for Forks and Pembina.

Erie Canal: 8th, water began to flow in canal. Twelfth, canal navigation opened.

Mississippi River: St. Paul, 1st, 3d and 4th, floating ice in river; 10th, steamer "War Eagle," from St. Louis, arrived; first boat of season.

Green Bay: Escanaba, 4th, during storm, ice broke in bay; no damage resulted to shipping interests. 7th, during night ice moved out of the middle of bay; navigation practically opened. 8th, barge "Nahant," from Asthabula, Ohio, arrived; first of season.

Lake Winneppissiogee: Lake Village, N. H., 25th, ice cleared in lake.

Cumberland River: Nashville, 29th, river very low; navigation on the Upper Cumberland is nearly suspended.

FLOODS.

Mobile, Alabama, 18th, 19th, owing to excessive rainfall many houses in city are flooded, compelling occupants to remove furniture to places of safety; some of the streets are impassable. In some instances stock has been in great danger of drowning. Memphis, 15th, the Memphis and Little Rock railroad company sent a train from this city through to Madison, Arkansas, being the first trip made over that road since January 30th, owing to the submerged condition of the track. Keokuk, Iowa, 22d, river rose above danger line during morning and continued to rise all day. The Saint Louis, Keokuk and Northwestern railroad company were compelled to discontinue trains. 23d, river fifteen inches above danger line; lumber yards and saw mills in lower part of town have abandoned work on account of high-water. 26th, river nearly stationary. 27th, river falling slowly. Dubuque, 19th, considerable damage has resulted from the recent heavy rains; lowlands have been flooded, cellars filled and gardens ruined. Land slides of trees, rocks and earth have occurred on the lines of the Chicago, Milwaukee and Saint Paul and the Illinois Central railroads, causing delay of trains. Saint Louis, 23d, the main sewer of the city drainage system gave way during the evening, being caused by the late heavy rains; fifteen blocks of houses were flooded almost instantly; many of the occupants had to be rescued in boats. The damage is estimated from $250,000 to $500,000. The rains throughout Kansas and Missouri were the heaviest ever known in places. At Effingham, Kansas, streams overflowed their banks and bridges were washed away. At Clarksville, Missouri, rain was very heavy, and the river rose to such an extent that it was feared the Sny levee would give way. Fargo, Dakota, 11th, the Red river is still rising and an ice dam threatens to form against the piers of the Northern Pacific bridge. All the cabins along the river on low ground are deserted, and the houses on Island park have the basements flooded. The water is now one foot above high-water of last year. The damage is estimated at $100,000. Mud is knee deep all over the city. The Union elevator is half under water and is in danger of falling. The Grand elevator is also half under water and basements are flooded. 21st, the Saint Paul, Minneapolis and Manitoba railroad bridge has been badly damaged by having its approaches nearly washed away. Their bridge across the Cheyenne river is being held down by cars loaded with railroad iron, the water running to a depth of two feet over the top of the bridge. At Grandin station both the railroad and wagon bridge were carried away. The water is running over the track the entire distance between Grandin and Harwood stations. At Hillsboro, a new and stoutly built bridge was lifted from its foundation. The bridge at Maysville has been carried away. The railroad bridge across the Elm river on the Casselton branch has been swept away. Nearly all the houses built on the low lands at Grand Forks have been carried away.

Saint Vincent, Minnesota, 23d, there are three feet of water on the track between Emmerson and this place. Until the water subsides, traffic will remain suspended between here and Saint Paul. The water has fallen eight feet during past twenty-four hours; enabling those who abandoned their homes on the flats to return to them.

New Ulm, Minnesota, 14th, the Minnesota river is gradually spreading over the bottom lands. Communication with Nicollet county is now only kept up with skiffs.

The water in the lower Mississippi river has continued to fall throughout the month. The subject of floods in this section has been considered in previous numbers of the Review. At the close of the month the stage of the water at New Orleans was eight inches, and at Vicksburg, two feet above the danger-line.

HIGH TIDES.

Indianola, Texas, 4th, 5th, 30th. Toledo, 23d, water in river higher than ever known, a condition caused by severe northeasterly gale. At 7 a. m. the water was six feet above the ordinary level. Considerable damage was done along the banks of the river; lumber was washed away; a pile-driver sunk and many small boats were lost. The embankment of the Toledo and Ann Arbor Harbor railroad was washed away for a considerable distance; both the embankment and a portion of the trestle were completely battered down. Damage is estimated at $3,000. Sandusky, 23d, water in bay suddenly rose fifteen feet, flooding the entire length of Railroad street, and reaching a greater height than has been known for twenty-five years. Large quantities of lumber were washed away. The water fell as rapidly as it rose.

The following table shows the highest stages of water, reached in the Ohio river, at Cincinnati, with dates of occurrences, since 1832:

YEAR.	DATE.	FEET.	INCHES.
1832	February 18th	62	11⅛
1847	December 17th	62	3⅜
1858	June 16th	43	10
1859	February 22d	55	5
1860	April 16th	49	2
1861	April 19th	49	5
1862	January 24th	57	4
1863	March 12th	42	9
1864	December 23d	45	1
1865	March 7th	56	3
1866	September 26th	42	6
1867	March 14th	55	3
1868	March 30th	48	3
1869	April 2d	48	9
1870	January 19th	55	3
1871	May 13th	40	6
1872	April 13th	41	9

DATE.	YEAR.	FEET.	INCHES.
1873	December 18th	44	5
1874	January 11th	47	11
1875	August 6th	55	4
1876	January 29th	51	9
1877	January 20th	53	9
1878	December 15th	41	4
1879	December 27th	42	9
1880	February 17th	53	2
1881	February 16th	50	7
1882	February 20th, 6 a. m.	54	1
1882	February 20th, 11.30 a. m.	54	11
1882	February 20th, 12.40 p. m.	55	7
1882	February 20th, 2.50 p. m.	55	10
1882	February 20th, 5.30 p. m.	56	3
1882	February 20th, 7 p. m.	56	6
1882	February 21st, 8 a. m.	55	6

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the right hand of chart ii. Observations on temperature of water were not taken at the following-named stations, on the dates given, on account of ice in harbors: Escanaba, first to eighth, inclusive; Marquette, first to sixth; Duluth, first to twenty-seventh.

In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the month. It will be seen that the greatest range of water temperature occurred at the west Gulf stations, where it ranged from 18°.4 at Indianola to 19° at Galveston. At the stations on the eastern Gulf the smallest ranges in water temperature were reported.

The following table gives the highest and lowest temperature of water observed at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken:

Temperature of Water for April, 1882.

	Temperature at bottom.		Range.	Average depth in feet and inches.		Mean temperature of the air at station.
	Max.	Min				
	°	°	°	ft.	in.	°
Atlantic City	53.3	45.	8.3	5	0	46.8
Alpena	44.	31.	13.0	12	0	36.7
Augusta	74.6	63.5	11.1	8	9	66.6
Baltimore	54.5	47.5	7.0	9	8	52.0
Boston	45.6	39.5	6.1	25	0	42.0
Buffalo	49.9	38.6	11.3	10	0	40.8
Burlington	38.3	34.	4.3	19	5	38.7
Cedar Keys	79.	71.	8.0	8	7	73.4
Charleston	45.	35.	10.0	40	8	66.6
Chicago	49.9	42.1	7.8	7	9	45.8
Chincoteague	59.	43.	16.0	6	4	48.9
Cleveland	50.	40.4	9.6	14	0	44.4
Detroit	46.	37.	9.0	24	2	45.9
Duluth	36.	34.5	1.5	15	3	37.5
Eastport	37.3	33.3	4.0	16	2	35.0
Escanaba	44.	33.	11.0	15	0	36.6
Galveston	77.	58.	19.0	14	9	72.5
Grand Haven	49.	30.5	18.5	10	0	43.6
Indianola	79.	60.6	18.4	9	3	73.1
Jacksonville	76.	71.	5.0	18	0	70.9
Key West	85.	73.5	11.5	17	2	78.5
Marquette	38.9	31.8	7.1	10	7	36.5
Milwaukee	47.1	39.6	7.5	8	0	42.8
Mobile	76.3	62.	5.3	18	0	70.5
New Haven	51.2	39.7	11.5	14	9	43.6
New London	46.	40.	6.0	12	11	44.7
Newport	46.	38.5	7.5	10	9	43.1
New York	49.3	41.3	8.0	22	2	46.1
New Shoreham	46.1	39.3	7.7	9	4	43.2
Norfolk	61.	54.	7.0	16	10	55.7
Pensacola	73.5	66.7	6.8	18	0	70.4
Portland, Me	42.	34.	8.0	19	2	43.3
Portland, Oreg	52.3	43.2	9.1	72	11	48.5
Port Eads	68.	64.	4.0	9	10	72.7
Provincetown	47.5	38.5	9.0	14	0	41.7
Punta Rassa	85.5	72.6	12.9	11	9	75.3
Sandusky	52.1	39.8	12.3	10	1	46.2
Sandy Hook	48.9	42.5	6.4	2	1	46.8
San Francisco	54.6	53.3	1.3	29	0	52.4
Savannah	71.4	64.9	6.5	13	4	68.0
Smithville	72.0	61.0	11.0	10	0	62.2
Toledo	55.	42.	13.0	11	9	46.5
Wilmington	69.5	61.5	8.0	13	0	63.2

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were of unusual frequency during the month. The display which began on the evening of the 16th was the most extraodinary that has occurred for many years, and was visible at a great number of stations throughout the United States. It was observed as far south as Key West, at stations in the Gulf states, in southern Texas, New Mexico, and California and by numerous steamships and vessels. On vessels in the north Atlantic, during the display, the magnetic needle deviated north and south of its true position; and long telegraphic circuits, extending north and south, east and west, in the United States were worked without the aid of battery. The following extract from a communication, published in "Nature," from Mr. A. G. Whipple, an English scientist, shows that its influence was also felt in England:

"It may interest some of your readers to know that a magnestic storm of unusual intensity raged from about midnight of Sunday, the 16th, to midnight of the 17th. We observe a tremendous spot which appeared on the sun's disc, first on the 13th, is now rapidly approaching the central meridian, and a group observed on Saturday a little in advance of it, appears to have undergone considerable change in the interval.

(Signed.) G. M. WHIPPLE,
Kew Observatory, Richmond, Surrey.

April 18th, 1882."

Eastport, Maine, 16th, a faint diffuse auroral light appeared in the north at 8 p. m. It gradually rose toward the zenith, increasing in brilliancy. At 8.30 p. m. a striated arc extending from northwest to northeast, with a breadth of 15° and altitude of 45°. At 8.40 p. m. the arc dissolved into numerous beams, all parallel to each other and pointing toward the zenith. At 9 p. m. the whole northern sky from west to east was filled with beams, some of which were of blood red and others of light red color. It continued to extend southward and at eleven p. m. reached the zenith, forming a half crown. At eleven thirty p. m., the whole sky was filled with beams, all pointing toward the zenith, forming a perfect corona, and some of the beams reaching within 10° of the southern horizon. At 11.40 p. m. the aurora became slightly obscured by cirrus clouds. At midnight it was still visible, though rapidly fading. Telegraphic communication was seriously interrupted by its influence.

Washington, District of Columbia, 16th, an aurora was visible at 9.54 p m., in the form of an arc, 2° in width and about 6° above the northern horizon; the base of the dark segment measuring about 35°. At 11 p. m., the arc was quite brilliant and of increased dimensions; the pale green light which had been formerly observed had then become quite strong; the summit of the arch had reached an altitude of 12°, the arch itself being fully 8° in width, while the base of the segment measured about 55°. At 11 p. m., a few faint streamers projected not more than 3° above and from the corona of the arch. At eleven post-meridian, the summit of the arch reached an altitude of 20° and extended from 100° to 250° azimuth; brilliant streamers, narrow and pointed at the ends, shot upward to the zenith from the whole length of the arch; the upward motion was very rapid, and resembled flashes of lightning. The streamers gradually diminished in length and brilliancy after midnight, and at 12.40 a. m. of seventeenth no motion was perceptible. At 12.45 a. m. the arch was faintly defined and without streamers. At 1.00 a. m. the arch was again well defined and of brighter color. At one-thirty the aurora revived, but did not equal its former brilliancy; the crown of the arch had an elevation of about 10°, without any change in its azimuth; broad streamers flashed upward at short intervals, some extending nearly to zenith. At 2 a. m. the streamers subsided, and at 2.12 a. m. the arch broke up into faint bands of light. At two-twenty-five only a faint light remained in tne northern sky. At

3.40 a. m. a small, well-defined arch of about 5° altitude and 30° azimuth, without streamers, was visible. At 4 a. m. a few streamers without motion were observed, and continued until daylight. The color of the aurora throughout the entire display was a pale yellow, with the exception of a broad streamer at the western extremity, which from 11.30 to 11.40 p. m. was of bright crimson. At Key West, Florida, from 1 to 1.30 a. m. on the 17th, the aurora was observed, consisting of a diffuse light, resembling the morning twilight, extending to an altitude of 10°, and from 134° to 190° azimuth.

Chicago, 16th, Aurora observed at 9.40 p. m., consisting of a hazy segment of 15° altitude, surmounted by an arch of light about 5° broad, extending from about 40° east of north to 30° west of north. The arch slowly ascended and at 10.15 p. m. was of about 40° altitude. During the next ten minutes the arch widened toward both zenith and horizon, and disappeared, leaving only a faint glow. At 10.30 p. m., vertical columns began to shoot upward from near the north point, toward the zenith, which were soon accompanied by similar displays from first the west, and afterward from the east; the aurora meanwhile having extended laterally to about 55° west of north and to about 70° east of north. The shafts gradually extended laterally and finally converged to a point about 15° south of the zenith, changing in color from pale yellow to blue, red and crimson, shooting up and down from horizon to zenith, resembling a ray of sunlight reflected from a rapidly rotated mirror. About 10.45 p. m. it reached its maximum brilliancy. The point of convergence near the zenith, a circular black nucleus presented a decided contrast to the brilliancy of the converging beams, which varied from a deep red at their summits, to a pale blue near the horizon. At this time the display covered two-thirds of the sky. At irregular intervals, a tremulous swinging movement from east to west, and vice-versa, was observed. At 10.55 p. m. it began to fade, and at eleven post-meridian only a faint glow remained, varied by occasional feeble beams shooting from the horizon toward the zenith. The wires of the various telegraph offices were unusually affected. At the Western Union Office, the batteries were detached and the wires worked to both Omaha and New York, the current being very powerful. Wires running north and south were also much affected but not nearly so powerfully as those running east and west. The display continued until daylight of the 17th, and was characterized by recurring fits;—consisting chiefly of vertical shafts shooting upward from the horizon with great rapidity and quickly disappearing, and a faint luminous glow resembling dawn.

At Indianola, Texas, the aurora was observed from 10 to 10.30 p. m. in the northern sky extending 10° east and 10° west of the magnetic meridian and to an altitude of 45°; no streamers or arch were visible but the aurora consisted of a diffuse pale red light, resembling the light of a distant prairie fire.

At Olympia, Washington Territory, from 12.30 to 12.50 a. m. the aurora was observed through broken clouds, resembling the glow of a distant fire.

At San Francisco, 16th, 8.15 p. m., an unusually brilliant aurora of deep crimson color, spread over the northern sky, extending to an altitude of 35°, with a wavy motion which soon afterwards settled to a dull steady glow and gradually died away at 9.30 p. m. At 11 p. m. it appeared again, consisting of several columns of white to orange color, extending to a height of 75°. The display attracted the attention of a large number of spectators, who imagined it to be the reflection from a large fire. At Visalia, California, the display began at 8.35 p. m. The northern sky from east to west was of a fiery color, with a motion from east to west; its greatest brilliancy occurred between 8.35 and 9 p.m.; altitude 50°; azimuth 135°; it remained visible until 4 a. m. of 17th.

The following interesting report furnished from the United States steamer "Vandalia," in lat. 30° 10′ N., long. 78° 19′ W., by Captain R. W. Mead, United States Navy, commanding, is of special interest: A very remarkable aurora-borealis was noticed, beginning at 10 p. m., Sunday, April 16th, and ending about 4:30 a. m., Monday, April 17th, 1882. It was preceded by an arc of greenish hue, the base of which was about 45° in length, with its centre not more than 10° in height, directly under the Pole star. This lasted about half an hour, when wave-like shafts of light of different shades of pink, blue, yellow and greenish white colors shot up, all converging toward a common point, about 20° directly above the north star. The base increased one point, ending at n.n.e. and the other at w.n.w. Evidently the compass was affected, for when the light at the northern point increased in intensity, the ship, apparently came to windward of the course, (attributed at the time to bad steering,) but when the light at the western end increased in brilliancy, the ship, apparently, fell off to the leeward. The compass course was northeast by east; wind east by north.

The display next in importance to that of the 16th, was observed during the evening of the 19th and early morning of 20th. At many stations it was scarcely less brilliant than that of the 16th. It was observed from stations in New England westward to Umatilla, Oregon, and southward to Nashville, Tennessee, and at Phœnix, Arizona. Displays of less importance and of varying brilliancy, also occurred on the following dates: 5th, 13th to 24th, 28th, 29th.

THUNDER STORMS.

They were reported in the various districts on the following dates:

New England, 2d, 4th, 6th, 7th, 19th, 20th.

Middle Atlantic states, 2d to 4th, 6th, 9th, 10th, 12th, 14th, 19th, 20th, 22d, 23d, 26th, 27th, 28th, 30th.

South Atlantic states, 2d to 5th, 7th to 10th, 12th, 19th, 20th, 22d, 23d, 27th to 29th.

Florida peninsula, 8th, 10th, 15th, 20th.

East Gulf states, 2d, 3d, 5th to 13th, 17th to 20th, 22d, 26th to 29th.

West Gulf states, 2d, 5th to 12th, 18th, 19th, 21st, 22d, 26th to 29th.

Rio Grande valley, 7th, 8th, 26th, 28th, 29th.

Ohio valley and Tennessee, 2d to 4th, 6th to 9th, 18th, 19th, 21st to 23d, 26th to 28th.

Lower lake region, 1st, 2d, 4th, 6th, 7th, 19th, 27th, 28th.

Upper lake region, 1st to 4th, 6th to 9th, 18th, 19th, 22d, 26th, 27th.

Upper Mississippi valley, 1st to 9th, 18th, 21st, 22d, 25th, 26th.

Missouri valley, 1st to 8th, 11th, 17th to 19th, 21st, 22d, 25th, 26th, 28th.

Southern slope, 4th, 5th, 7th, 10th, 11th, 21st, 26th to 30th.

Southern plateau, 1st, 3d, 12th to 14th, 16th, 29th, 30th.

Thunder-storms were also reported from the following stations not included in the districts named above: Bismark, Dakota, on the 7th; Blackfeet Agency, Montana, on 24th; Fort Custer, Montana, 6th; Terry's Landing, Montana, 24th; Fort Washakie, Wyoming, 11th; Fort Collins, Colorado, 17th; Pike's Peak, 4th; North Platte, Nebraska, 4th, 8th, 17th, 25th; Dodge City; Kansas, 7th; Spokane, Washington, 26th; Eagle Rock, Idaho, 3d; Boise City, Idaho, 22d; Fort McDermitt, Nevada, 3d.

During thunder-storms the following instances of damage by lightning occurred: Burlington, Vermont, 6th, at Winooska Falls, during morning, a church was struck by lightning; a cross on the building was thrown down and a quantity of slating was torn off. Chattanooga, 22d, a tree was struck by lightning; a person in vicinity was stunned and a cow killed. Friendship, New York, 2d, 6 a. m., lightning struck an oil-tank and two derricks. Buffalo, 2d, the railroad station at Buffalo Plains was struck by lightning, set on fire and destroyed. Another building was also consumed at the same time.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England, 1st, 4th to 6th, 8th, 10th, 19th, 24th, 25th.
Middle Atlantic states, 1st, 3d, 4th, 9th, 18th, 22d to 24th, 26th, 29th.
South Atlantic states, 1st, 13th, 18th, 22d, 26th.
East Gulf states, 17th, 20th, 24th, 25th, 30th.
West Gulf states, 3d, 4th, 6th, 8th, 20th, 24th, 27th.
Tennessee, 5th, 6th, 11th, 18th, 28th.
Ohio valley 1st to 6th, 8th, 11th, 12th, 17th, 18th, 20th, 21st, 24th, 27th, 28th.
Lower Lake region, 1st, 4th, 5th, 7th, 9th, 18th, 19th, 22d, 23d, 25th, 26th, 29th.
Upper Lake region, 10th, 12th, 16th, 17th, 18th, 21st to 26th, 28th.
Upper Mississippi valley, 4th to 7th, 11th, 12th, 21st, 23d, 24th.
Missouri valley, 3d to 6th, 18th, 29th.
North Pacific coast region, 2d, 12th, 13th, 29th, 30th.
Middle Pacific coast region, 4th, 7th, 10th, 11th, 14th, 16th, to 19th, 21st, 22d, 28th to 30th.

Solar halos were also reported from the following stations not included in the districts named above: Key West, 9th, 10th, 16th, 19th; Santa Fé, New Mexico, 2d, 12th; Salt Lake City, 12th, 29th; Umatilla, Oregon, 13th; Dayton, Washington, 29th; Carson City, Nevada, 11th; San Diego, California, 9th; Campo, California, 27th.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England, 4th, 26th, 29th.
Middle Atlantic states, 2d, 4th, 8th, 14th, 16th, 23d, 25th, 28th, 29th.
South Atlantic states, 1st, 3d, 5th, 19th, 27th, 28th, 30th.
East Gulf states, 24th, 26th, 27th, 29th, 30th.
West Gulf states, 3d, 4th, 23d to 25th, 27th, 29th; Tennessee, 5th, 21st, 26th,; Ohio valley, 3d to 6th, 13th, 23d, 25th, 28th.
Lower lake region, 1st, 3d, 10th, 26th.
Upper lake region, 1st, 3d to 6th, 8th, 16th, 20th, 22d to 26th, 29th.
Upper Mississippi valley, 1st, 3d to 6th, 22d, 23d, 25th, 26th.
Southern slope, 1st to 3d, 23d, 24th, 26th, 30th.
Northern slope, 22d, 25th.
Southern plateau, 1st, 2d, 28th, 29th.
North Pacific coast region, 28th, 29th.
Middle Pacific coast region, 1st, 4th, 22d, 26th, 30th.

Lunar halos were also reported from the following stations not included in the districts named above: Fort Brown, Texas, 3d; Fort Yates, Dakota, 27th; Yankton, Dakota, 20th; Protem, Missouri, 3d, 4th; Fort Washakie, Wyoming, 29th; Pike's Peak, Colorado, 2d; Spokane, Washington, 1st; Winnemucca, Nevada, 8th; Salt Lake City, Nevada, 2d, 22d, 29th; Umatilla, Oregon, 23d, Boise City, Idaho, 29th; Visalia, California, 1st, 28th, 30th.

MIRAGE.

Rio Vista, California, 17th; Alexandria, Dakota, 4th, 15th, 28th, 29th; Indianola, Texas, 23d, 29th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 187 stations show 5,494 abservations to have been made, of which 25 were reported doubtful; and of the remainder, 5,469, there were 4,539, or 83.0 per cent., followed by the expected weather.

SUN SPOTS.

The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE—Ap'l, 1882.	No. of new		Disappear'd by solar rotation.		Reappear'd by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 1 p. m...	1	2	0	0	0	0	6	30‡	
2, 1 p. m...	2	10‡	0	0	0	0	8	40‡	
4, 3 p. m...	0	15	2	10	0	0	5	40‡	
7, 4 p. m...	3	20‡	2	15	.....	.....	6	45‡	Spots probably disappeared by solar rotation.
9, 1 p. m...	1	5	0	5	1	5	7	45‡	
12, 1 p. m...	2	23‡	1	5	2	20‡	8	65‡	
13, 1 p. m...	0	5	1	3	0	5	5	55‡	
16, 12 m.....	1	30‡	0	0	1	2	6	85‡	
17, 6 p. m...	1	35‡	0	5	1	2	7	123‡	Many of the spots very small.
18, 5 p. m...	2	40‡	1	2	0	0	8	160‡	
20, 1 p. m...	0	0	1	10‡	0	0	7	125‡	
21, 2 p. m...	1	1	1	5	1	1	7	110‡	Many of the spots small.
24, 2 p. m...	0	0	.....	.....	0	0	3	20‡	Three large groups of spots probably disappeared by solar rotation.
25, 1 p. m...	0	0	0	6	0	0	3	14	
28, 4 p. m...	1	6	1	8	0	0	3	12	
30, 12 m	1	8	2	6	.....	.....	1	8	Spots probably disappeared by solar rotation.

‡Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Indiana, reports: 1st, eight groups, thirty-three spots; 4th, six groups, fifty-six spots; large group of small spots in northeast quadrant and large spot east of centre; 5th, seven groups, sixty spots; 11th, eight groups, thirty-six spots; large group east of centre; 12th, seven groups, sixty-five spots; several large groups east of centre; five of the spots very large; several others quite prominent; very large spot and prominent penumbra at east edge; air very poor; 13th, five groups, sixty-five spots; the large spot is 1′ from east edge; 14th, seven groups, seventy-five spots; one spot quite large; many others quite prominent; air poor; 15th, nine groups, one-hundred and forty spots; one very large group in southwest quadrant; the eastern group easily seen without telescope; 16th, eight groups, one-hundred and sixty spots, twelve of which are large and twelve others quite prominent; 17th, nine groups, one hundred and seventy-five spots; two very large groups south of centre; one easily seen without telescope; six groups, ninety-five spots; one visible without glass; 24th, three groups, thirty-five spots; one large group has disappeared; one large spot west of centre; 25th, three groups, thirty spots; 27th, five groups, twenty-five spots; 28th, three groups, twenty spots, all of which are small; 30th, three groups, eighteen spots. Mr. David Trowbridge, at Waterburg, New York, reports: 3d, six groups, twelve spots; faculæ in west; 7th, seven groups, twelve spots; faculæ in east; 15th, seven groups, twenty-two spots, several of which are large; one group in east easily seen without telescope; one large group in west; 16th, seven groups, twenty-five spots; one group has disappeared and one appeared by rotation. There are visible ten spots included in one penumbra in the large group which is still plainly visible without telescope; it occupies fully one-fifteenth of the solar diameter; 17th, six groups, twenty-two spots; one group has disappeared and another is very faint; the large group still seen with unassisted eye; 18th, six groups, twenty-six spots; one group has appeared and one has disappeared by rotation; two groups now visible without telescope; 22d, four groups, seven spots; the two large groups near west margin are no longer visible without telescope, one of which was visible for six days without aid of glass; 23d, light groups, twelve spots; 24th, four groups, seven spots; one large group has disappeared by rotation; 25th, three groups, seven spots; faculæ near the large group and in the east; 26th, two groups, four spots; large group has disappeared by rotation; 29th, one group, one spot; faculæ; 30th, one group, three spots; faculæ in east. Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: Sunspots were observed on every clear day during the month; they were largest and most active from fifteenth to twenty-first; smallest and least numerous on twenty ninth and thirtieth; the groups and spots were exceedingly large from seventeenth to nineteenth.

The following record of observations has been forwarded by

Mr. A. G. Bender, Sacramento, California: "Fourth, two p. m., four groups, fifteen spots; two new groups, nine spots, appeared since the thirty-first ultimo; fourth and fifth, four groups, fifteen spots; eleventh, two p. m. six groups, twenty-five spots; one new group, nine spots; one group, one spot reappeared by rotation; twelfth, four p. m., six groups, thirty-five spots; one group, five spots, has disappeared by rotation and one group, five spots, has reappeared by rotation; thirteenth and fourteenth, six groups, forty spots; fifteenth, four p. m., seven groups forty-five spots; one new group, one spot; sixteenth, four p. m., six groups, forty spots; one group, one spot has reappeared by rotation, and one group, one spot has disappeared; seventeenth, 3.30 p. m., six groups, forty-five spots; one new group, three spots; one group one spot has disappeared by rotation; 18th, half-past three p. m., six groups, forty spots; 20th, half-past three p. m., five groups, forty spots, one group, one spot has disappeared by rotation; 21st, half-past three p. m., six groups; one new group, one spot; 22d, half-past three p. m., six groups, forty spots; 23d, four groups, thirty-five spots; one group, ten spots has disappeared by rotation; new spots have appeared in the old groups; 24th, half-past three p. m., three groups, twenty spots; one group, ten spots has disappeared by rotation; 25th, half-past three p. m., two groups, ten spots, some of which are faint; one group, ten spots, has disappeared by rotation; 26th, two groups, ten spots; 27th half-past three p. m., one group, one spot; ten spots has disappeared by rotation; 28th, two groups, three spots, one new group, two spots; 29th, one group, two spots; one group, one spot has disappeared by rotation; Thirtieth, three-thirty p. m., one new group, six spots; one group, two spots has disappeared by rotation. At all observations during the month, when ten or more spots have been reported, the number given is estimated. At Winnemucca, Nevada, twentieth, two large spots were observed on the sun through an ordinary marine glass. They were also visible on twenty-first, Cincinnati, 17th. Prof. Stowe, of the Cincinnati Observatory reports, that the largest number of sun spots ever observed here were seen this morning, numbering three hundred and sixty in seven distinct groups, two of which could be seen with the unassisted eye. They could also be seen without the aid of the telescope on the nineteenth.

The following report was made by Mr. Arthur Binns, second officer, on the s. s. "City of Paris," of the Inman Line, and furnished through the courtesy of the New York Herald Weather Service: at noon of April 22nd, in 49° 03′ N., 22° 00′ W., a black spot was observed on the sun's surface about 6′ from the southwest edge.

METEORS.

Rio Vista, California, 12th; Monticello, Iowa, 26th; Woodstock, Maryland, 16th; Protem, Missouri, 6th; Somerville, New Jersey, 18th; Moorestown, New Jersey, 16th; North Volney, New York, 16th; North Lewisburg, Ohio, 16th; Stateburg, South Carolina, 10th, 20th; Cedar Keys, Florida, 14th; Yuma, Arizona, 5th, 28th. The following reports of a remprkable meteor were received too late to appear in the March REVIEW:

Fort Assinnaboine, Montana, March 8th, 8.30 p. m., an enormous meteoric stone fell southeast of station, lighting up the surrounding country as if caused by a vivid flash of lightning. Upon striking the earth a violent jar was felt resembling an earthquake shock, which was followed by a loud report like that of a cannon. The interval between the shock and report is variously estimated from four to eight minutes. At Fort Benton, Montana, about 10 p. m. a shock like that produced by an earthquake was felt. At Coal Banks, Montana, a bright glare was observed, followed a few minutes later by a loud report. A trembling of the earth was distinctly felt.

MIGRATION OF BIRDS.

Geese flying northward: Somerset, Massachusetts, 2d, 14th, 26th; Fall River, Massachusetts, 8th; Newport, Rhode Island, 30th; Clear Creek, Nebraska, 17th, 20th; Moorestown, New Jersey, 12th; Readington, New Jersey, 23d; Embarass, Wisconsin, 29th, 30th; Shreveport, Louisiana, 23d; Grand Haven, Michigan, 19th; Port Huron, Michigan, 29th; Fort Yates, Dakota, 1st; Bismarck, Dakota, 15th; Huron, Dakota, 2d, 3d, 4th,; Springfield, Massachusetts, 3d; Red Bluff, California, 14th, 21st, 22d.

Geese flying southward: Fort Missoula, Montana, on the 11th.

Cranes flying northward: Monicello, Iowa, on the 2d.

Sand Hills flying northward: Monticello, Iowa, 2d.

Ducks flying northward: Monticello, Iowa, 2d; Lansing, Michigan, 1st, Indianola, Texas, 29th; Des Moines, Iowa, 29th; Huron, Dakota, 2d, 3d, 20th.

POLAR BANDS.

New Corydon, Indiana, 1st, 3d, 12th, 18th, 21st, 23d, 24th, 25th, 27th, 28th; Dana, Iowa, 21st; Fayette, Mississippi, 8th; Freehold, New Jersey, 22d; Vineland, New Jersey, 15th; Wytheville, Virginia, 10th, 12th, 27th, 28th; Florence, Arizona, 10th, 12th.

ZODIACAL LIGHT.

New Corydon, Indiana, 15th, 16th; Monticello, Iowa, 11th, 14th, 26th; Yates Centre, Kansas, 16th; Cornish, Maine, 17th; Fall River, Massachusetts, 17th; Cambridge, Massachnsetts, 5th, 7th, 8th, 12th, 16th, 17th, 18th, and suspected on the 23d; Atco, New Jersey, 8th, 12th, 13th, 16th, 17th, 18th; Franklin, Wisconsin, 14th; Lynchburg, Virginia, 16th; Nashville, Tennessee, 8th, 16th, 17th; Leavenworth, Kansas, 16th; Dayton, Washington, 6th, 11th, 17th.

WATERSPOUTS.

Captain N. S. Tracy, of the American brig "Teneriffe," reports: April 30, in 32° 31′ N, 77° 17′ W., saw several waterspouts.

EARTHQUAKES.

Portland, Or., 30th, 10.48 p. m., a slight shock of earthquake lasting about two seconds, followed about three seconds later by a more severe shock accompanied by a low rumbling sound of from five to seven seconds duration. Every building in the city was shaken and persons sleeping were aroused. In the larger buildings, the shock was more sensibly felt. The direction of the wave seemed to be from a point north of east to a point south of west. The shock was by far the most severe ever felt in this city. No damage was done other than the excessive fright caused. It is reported from Oregon City, that two distinct shocks were felt at that place; one being very slight and the other heavy; and at 12.25 a. m. of May first, another slight shock was felt.

Olympia, Washington territory, 30th, 10.50 p. m., severe earthquake shock; wave seemed to be from west to northwest, followed by a succession of tremblings, lasting six or eight seconds, and then by a heavy shock, almost throwing persons from their feet; large trees were swayed to and fro as from a heavy blast of wind; clocks were stopped and crockery broken; two chimneys in the city were thrown down. The ground seemed to have an undulatory motion. Duration of the entire shock was about twenty-five seconds. Fort Canby, Washington territory, 30th, 10.50 p. m., four distinct earthquake shocks were felt at this place, lasting about fifteen seconds; vibration from southwest to northeast. Victoria, British Columbia, 30th, 10.45 p. m., a shock of earthquake lasting several seconds was felt at this place; vibration from west to east.

San Francisco, California, 13th, 6.30 a. m., a sharp earthquake shock, of a vibratory motion from north to south, was felt in this city, lasting about four seconds.

New Market, Virginia, 2d, several earthquake shocks were felt in this section; the direction of movement being northeast and southwest; some of the houses were perceptibly shaken.

PRAIRIE AND FOREST FIRES.

Alexandria, Dakota, 10th, to 15th; Monticello, Iowa, 7th;

Creswell, Kansas, 7th, 8th, 12th, to 15th, 20th, 24th, 26th, 29th; Protem, Missouri, 3d, and 21st; De Soto, Nebraska, 14th, 25th; Wytheville, Virginia, 19th; Fort Gibson, Indian territory, 4th, 5th, 6th, 11th, and 14th; Moorhead, Minnesota, 15th, 28th; Yankton, Dakota, 1st, 13th, 24th, 26th; Tobacco Garden, Dakota, 1st, 4th; Ferry's Landing, Montana, 1st, 3d, 12th, 13th, 21st; North Platte, Nebraska, 9th, 18th, 25th.

DROUGHT.

Indianola, Texas, 26th, crops are suffering from drought; flower and vegetable gardens are seriously affected. Coleman City, Texas, 21st, the wheat crop in this section has been destroyed by drought; farmers are cutting it to be used for hay. Henrietta, Texas, drought is seriously affecting crops; farmers fear that their entire crop will be a failure unless the drought soon ends.

INSECTS.

Lewiston, Idaho, 2d, grasshoppers are appearing in this vicinity in large numbers. Little Rock, Arkansas, 2d, a small insect called the buffalo gnat, which appears to come out of the ground, especially in the prairie and swamp lands, have appeared in the city in great numbers and are very troublesome; they are most annoying and do the most damage near the overflowed districts, where it is necessary for owners of stock to build fires through the forest for protection. Horses and cattle will stand in dense volumes of smoke to avoid the bite of tho insect; much stock has been killed by them within the past few days, and deer suffer from their ravages.

SAND STORMS.

Fort Yuma, California, 6th, 9th, 10th, 16th, 17th, 20th; Fort Garland, Colorado, 6th; Fort Stanton, New Mexico, 5th, 6th, 7th, 8th, 21st; Clear Creek, Nebraska, 3d; Stockton, Texas, 21st; Phœnix, Arizona, 6th, 10th, 13th, 15th, 16th, 20th; Santa Fé, New Mexico, 16th; Camp Thomas, Arizona, 3d, 4th, 6th, 7th, 10th, 11th, 14th, 16th, 17th, 20th, 21st, 29th, 30th; Winnemucca, Nevada, 15th, 19th, 22d, 23d, 24th; Umatiila, Oregon, 6th; Visalia, California, 2d; Yuma, Arizona, 3d, 6th, 9th, 10th, 16th, 20th, 21st; Lincoln, Nebraska, 3d; severest sand storm that has been known in this state for many years.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

Copy furnished for

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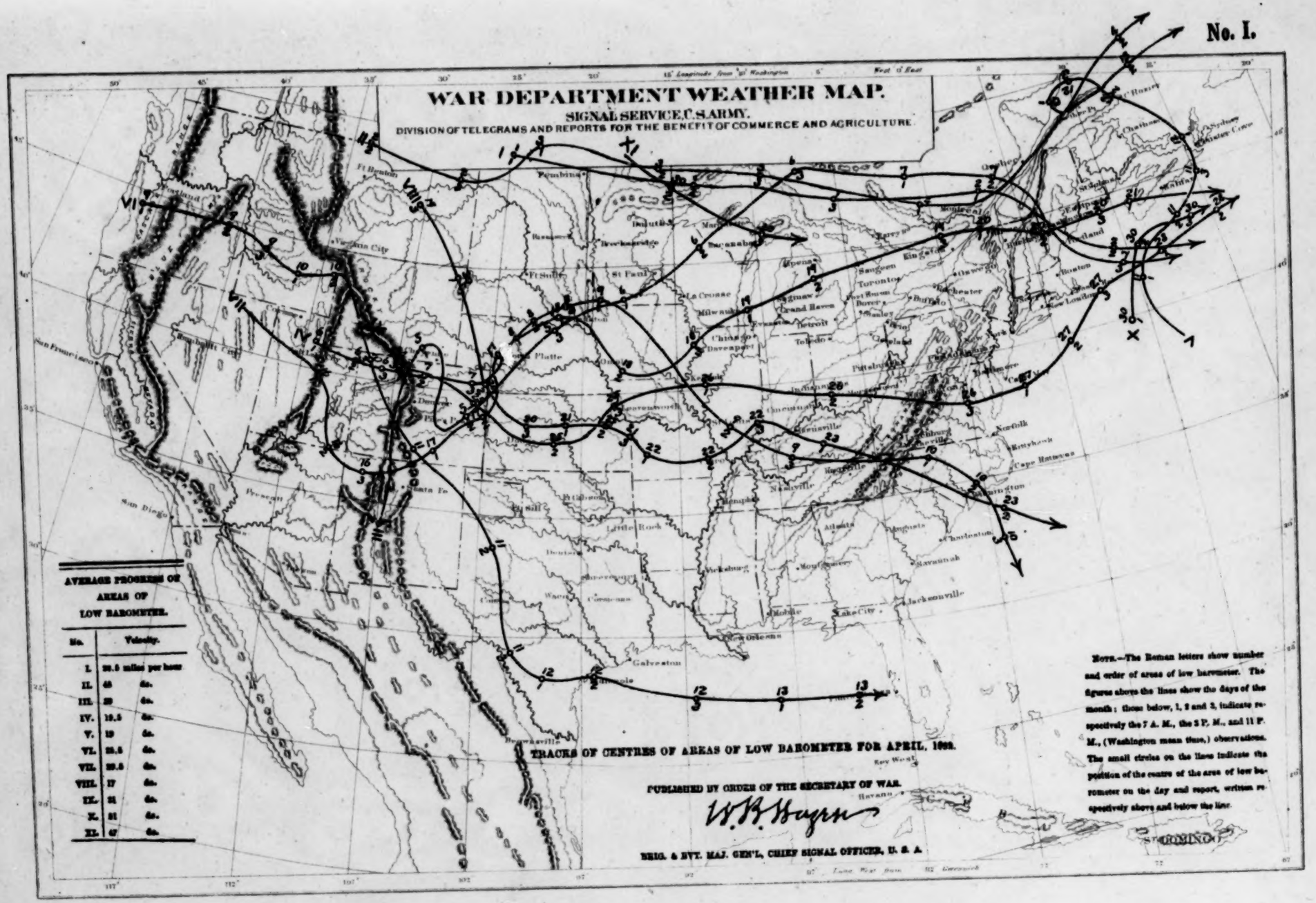
No. I.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U.S.ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. | Velocity.
I. 30.5 miles per hour
II. 46 do.
III. 29 do.
IV. 19.5 do.
V. 19 do.
VI. 23.5 do.
VII. 29.5 do.
VIII. 17 do.
IX. 21 do.
X. 21 do.
XI. 47 do.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR APRIL, 1872.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 2 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

No. II.

WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE U.S.ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR APRIL, 1882.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

AVERAGE TEMPERATURE FOR APRIL, 1882.

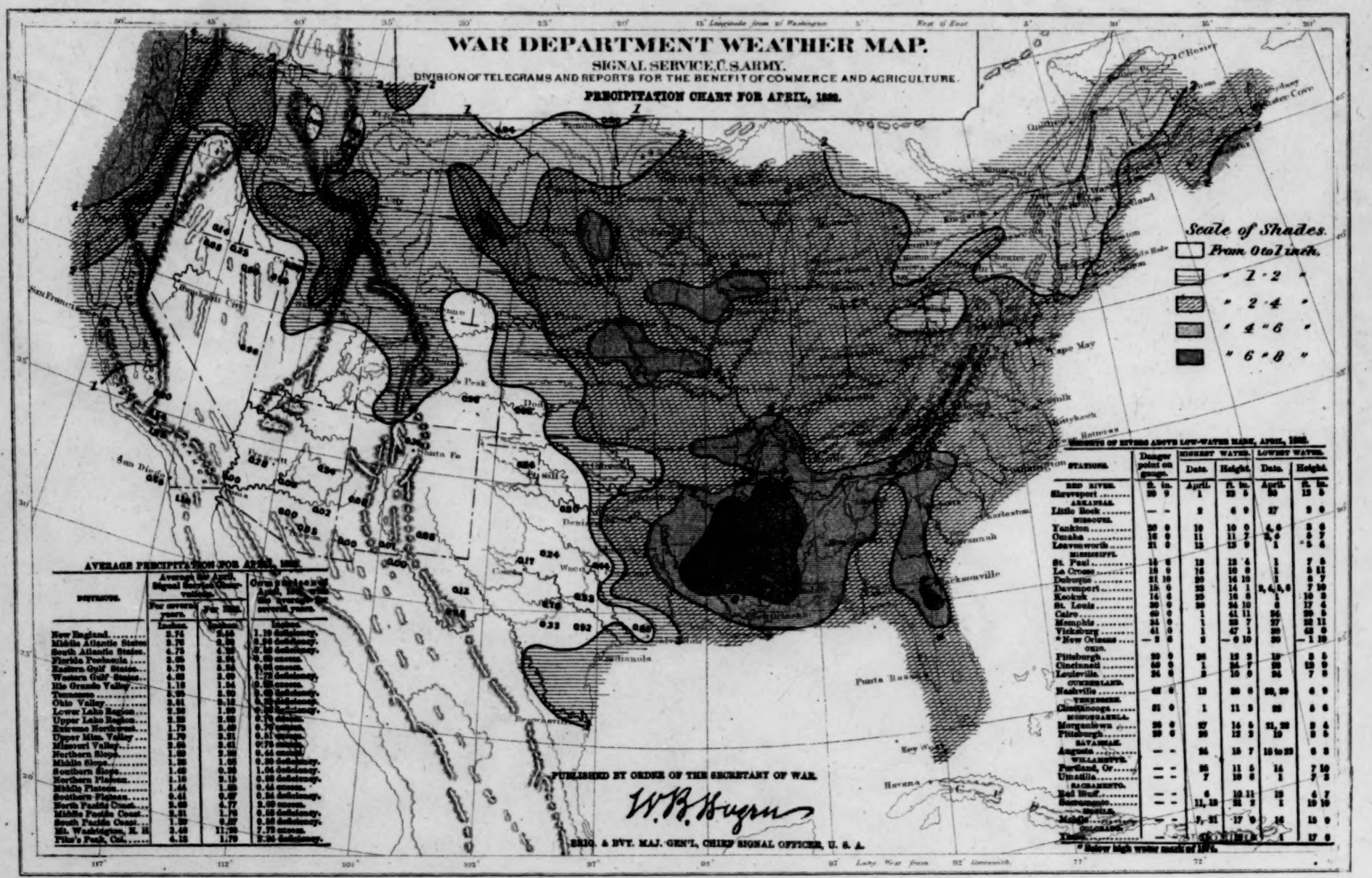
DISTRICTS.	Average for April, Signal Service observations. For several years.	For 1882.	Comparison of April, 1882, with the average for several years.
	°	°	°
New England	42.5	42.1	0.4 below.
Middle Atlantic States	49.9	50.7	0.8 above.
South Atlantic States	61.6	62.6	1.0 above.
Florida Peninsula	71.9	74.5	2.6 above.
Eastern Gulf States	64.5	67.7	3.2 above.
Western Gulf States	66.6	66.4	0.2 below.
Rio Grande Valley	74.7	75.3	0.6 above.
Tennessee	59.8	62.0	2.1 above.
Ohio Valley	53.3	54.2	1.0 above.
Lower Lake Region	43.5	42.5	1.0 below.
Upper Lake Region	40.1	40.4	0.3 above.
Extreme Northwest	37.7	37.9	0.2 above.
Upper Miss. Valley	46.3	50.3	3.0 above.
Missouri Valley	48.0	50.1	2.1 above.
Northern Slope	43.4	41.7	1.7 below.
Middle Slope	50.3	50.0	0.3 below.
Southern Slope	62.4	65.7	3.3 above.
Northern Plateau	49.2	46.3	2.9 below.
Middle Plateau	49.3	44.6	4.7 below.
Southern Plateau	60.0	58.2	1.8 below.
North Pacific Coast	50.7	47.6	3.1 below.
Middle Pacific Coast	56.3	54.9	2.4 below.
South Pacific Coast	60.1	57.7	2.4 below.
Mt. Washington, N. H	20.6	16.7	4.1 below.
Pike's Peak, Col	12.1	12.5	0.4 above.

TEMPERATURE OF WATER FOR APRIL, 1882.

STATIONS.	Temperature at bottom. Max.	Min.	Average depth of water. feet.	inch.
Atlantic City	55 3/4	45	5	0
Alpena	44	31	12	0
Augusta	74.6	63.5	6	9
Baltimore	54.5	47.9	9	8
Boston	45.6	39.5	25	0
Buffalo	49.9	39.6	10	0
Burlington, Vt.	56.3	34	19	5
Cedar Keys	79	71	6	7
Charleston	65	55	49	6
*Chicago	49.9	45.1	7	9
Chincoteague	59	48	6	4
*Cleveland	50	40.4	14	0
Detroit	46	37	34	2
Del. Breakwater				
*Duluth	36	34.5	15	3
Eastport	37.3	33.9	16	2
*Escanaba	44	33	15	0
Galveston	77	58	14	9
Grand Haven	49	39.5	19	0
Indianola	79	60.6	9	3
Jacksonville	76	71	14	6
Key West	85	73.5	17	3
*Marquette	38.9	31.8	10	7
Milwaukee	47.1	39.6	5	0
Mobile	70.8	65	16	6
New Haven	51.3	39.7	14	8
New London	46	40	13	11
Newport	46	38.5	10	0
New York	49.2	41.3	22	2
New Shoreham	46.1	39.3	9	4
Norfolk	61	54	16	10
Pensacola	73.5	66.2	18	6
Portland, Me	42	34	10	2
Portland, Or	52.8	43.2	72	11
Port Eads	68	64	9	10
Provincetown	47.5	38.5	14	6
Punta Rassa	85.5	72.6	11	9
Sandusky	53.1	39.9	10	1
Sandy Hook	48.9	42.5	7	1
San Francisco	54.6	53.1	22	0
Savannah	71.4	64.9	13	4
Smithville	72	61	10	0
Thatcher's Isl'd.				
Toledo	55	43	11	0
Wilmington	60.8	61.5	13	9

*Observations wanting—See text.

No. III.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
PRECIPITATION CHART FOR APRIL, 1882.
Scale of Shades.
From 0 to 1 inch.
" 1 - 2 "
" 2 - 4 "
" 4 - 6 "
" 6 - 8 "
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

AVERAGE PRECIPITATION FOR APRIL, 1882.

DISTRICTS.	Average for April, Signal Service observations. For several years.	For 1882.	Given by observers for April, 1882, with the average for several years.
	Inches.	Inches.	Inches.
New England	3.74	2.66	1.19 deficiency.
Middle Atlantic States	3.76	3.39	0.68 deficiency.
South Atlantic States	4.75	4.39	0.56 deficiency.
Florida Peninsula	3.69	3.84	0.69 excess.
Eastern Gulf States	5.79	5.84	0.04 excess.
Western Gulf States	4.68	2.99	1.77 deficiency.
Rio Grande Valley	1.18	1.34	0.35 excess.
Tennessee	5.25	2.93	1.69 deficiency.
Ohio Valley	3.61	3.12	1.23 deficiency.
Lower Lake Region	2.30	1.49	0.56 deficiency.
Upper Lake Region	2.25	2.03	0.75 excess.
Extreme Northwest	1.79	2.49	0.70 excess.
Upper Miss. Valley	2.79	2.21	0.51 excess.
Missouri Valley	2.68	2.61	0.70 excess.
Northern Slope	1.69	2.13	0.44 excess.
Middle Slope	1.33	1.05	0.30 deficiency.
Southern Slope	1.63	0.78	1.04 deficiency.
Western Plateau	1.15	1.15	0.22 deficiency.
Middle Plateau	1.44	1.89	0.44 excess.
Southern Plateau	0.41	0.07	0.34 deficiency.
North Pacific Coast	5.69	4.77	2.09 excess.
Middle Pacific Coast	3.31	1.78	0.19 deficiency.
South Pacific Coast	1.39	0.37	0.82 deficiency.
Mt. Washington, N. H.	3.49	11.75	7.75 excess.
Pike's Peak, Col.	4.15	1.79	2.26 deficiency.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, APRIL, 1882.

STATIONS.	Danger point on gauge.	HIGHEST WATER. Date.	Height.	LOWEST WATER. Date.	Height.
	ft. in.	April.	ft. in.	April.	ft. in.
RED RIVER.					
Shreveport	20 0	1	22 5	30	13 6
ARKANSAS.					
Little Rock	— —	2	6 9	27	2 0
MISSOURI.					
Yankton	20 0	10	10 0	4, 5	3 0
Omaha	16 0	11	11 7	2, 3	5 7
Leavenworth	21 0	12	15 9	1	5 4
MISSISSIPPI.					
St. Paul	10 0	13	13 4	1	7 6
La Crosse	15 0	14	10 0	1	5 11
Dubuque	21 10	20	14 10	1	6 7
Davenport	15 0	23	14 1	2, 4, 5, 6	7 10
Keokuk	14 6	25	16 6	1	10 2
St. Louis	30 0	30	24 10	6	17 4
Cairo	40 0	1	41 11	24	29 5
Memphis	34 0	1	33 7	27	32 11
Vicksburg	41 0	1	47 1	30	43 0
*New Orleans	— 2 6	1	— 0 10	30	— 1 10
OHIO.					
Pittsburgh	22 0	26	12 2	17	3 5
Cincinnati	50 0	1	34 7	28	13 9
Louisville	24 0	2	10 0	24	7 9
CUMBERLAND.					
Nashville	40 0	13	30 6	28, 30	6 9
TENNESSEE.					
Chattanooga	81 0	1	11 9	28	4 6
MONONGAHELA.					
Morgantown	25 0	27	14 6	21, 22	2 4
Pittsburgh	22 0	26	12 2	19	3 5
SAVANNAH.					
Augusta	— —	24	15 7	15 to 23	6 8
WILLAMETTE.					
Portland, Or.	— —	25	11 5	14	7 10
Umatilla	— —	7	19 6	1	7 2
SACRAMENTO.					
Red Bluff	— —	6	10 11	19	4 7
Sacramento	— —	11, 12	21 2	1	15 10
SNAKE.					
Middle	— —	9, 21	17 9	16	15 9
COLUMBIA.					
Yakima	— —	[illegible]	[illegible]	1	17 6

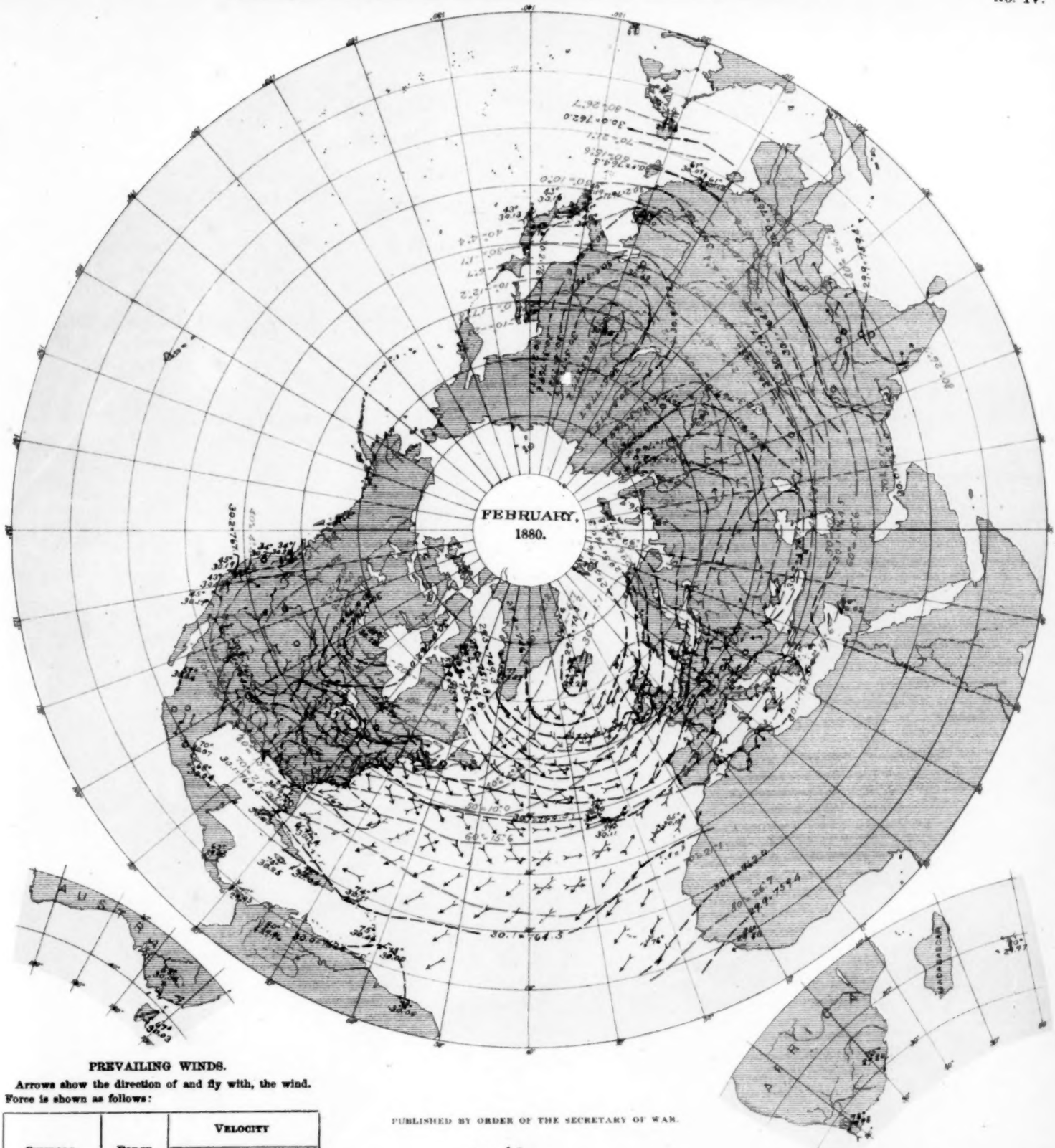
* Below high water mark of 1874.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



PREVAILING WINDS.

Arrows show the direction of and fly with, the wind. Force is shown as follows:

Symbols.	Force.	Velocity	
		Miles per hour.	Metres per second.
O	0	0	0
→	1, 2	0 to 9	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

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W. B. Hazen

BRIG. & BVT. MAJ. GEN'L.
CHIEF SIGNAL OFFICER, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *black*; detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

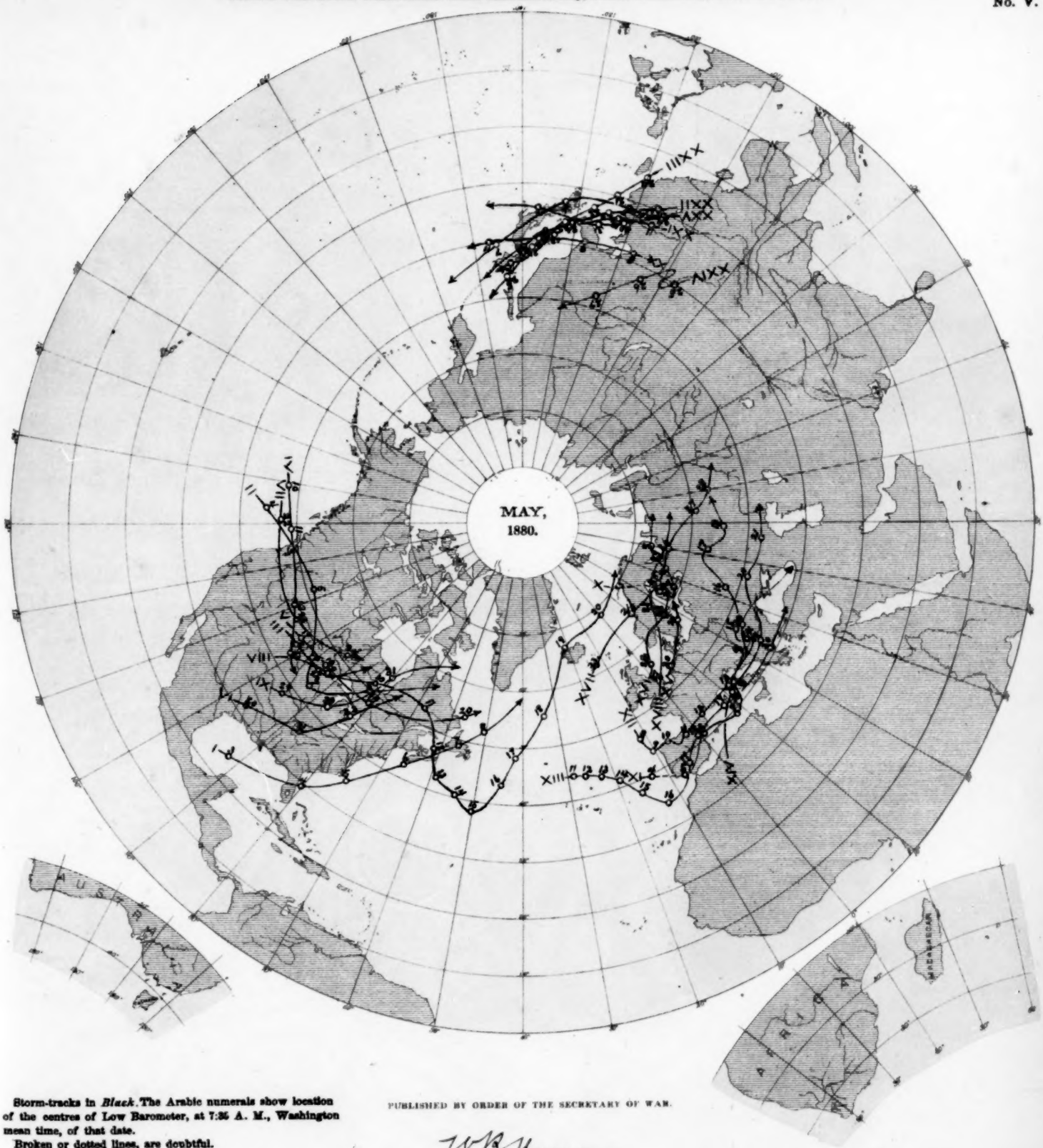
Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of February, 1880, based on the daily charts of the International Bulletin.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

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W. B. Hazen

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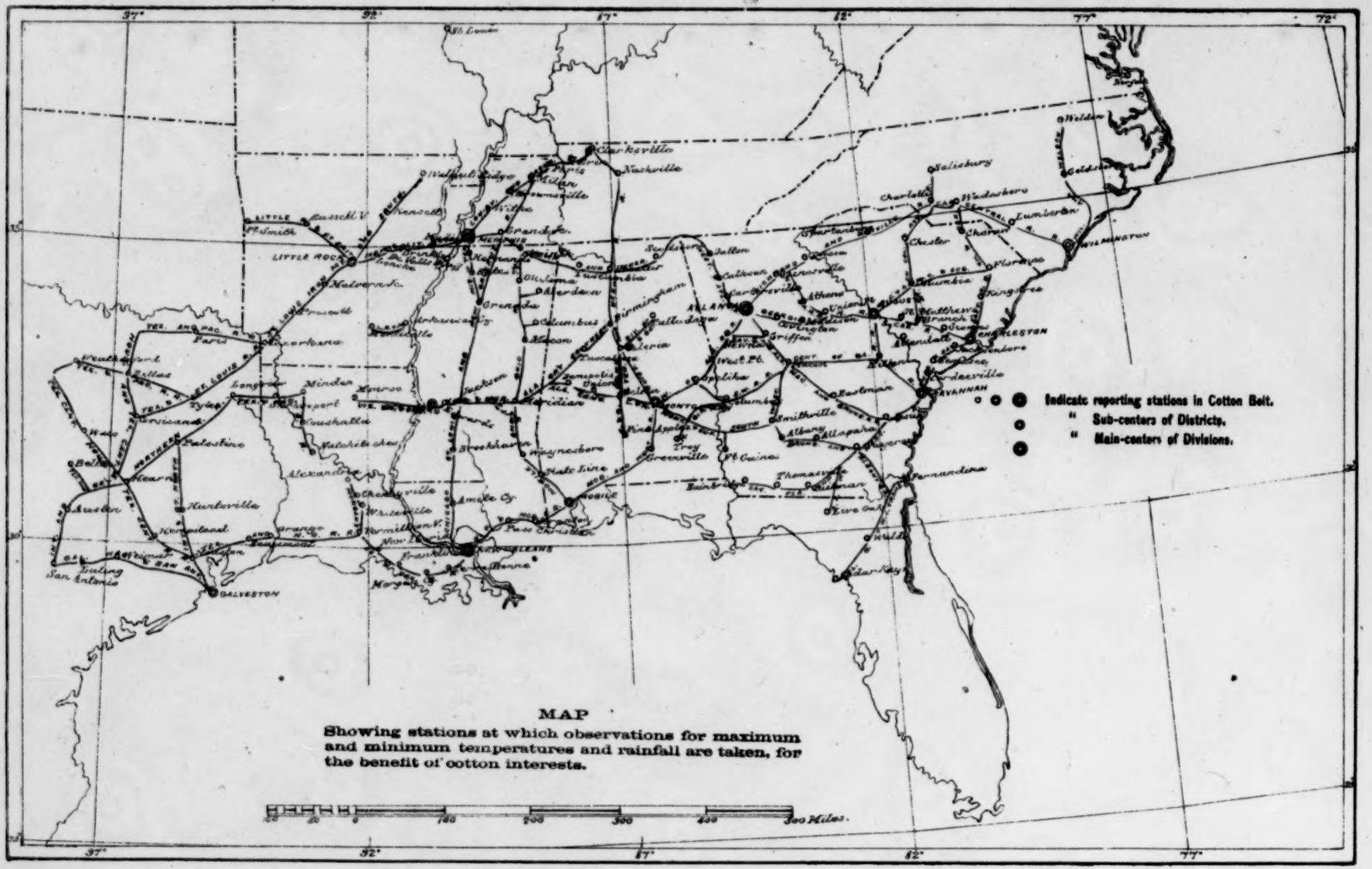
CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL CHART.

Showing Tracks of Centres of Low Barometer for May, 1880.

No. 6.



MAP

Showing stations at which observations for maximum and minimum temperatures and rainfall are taken, for the benefit of cotton interests.

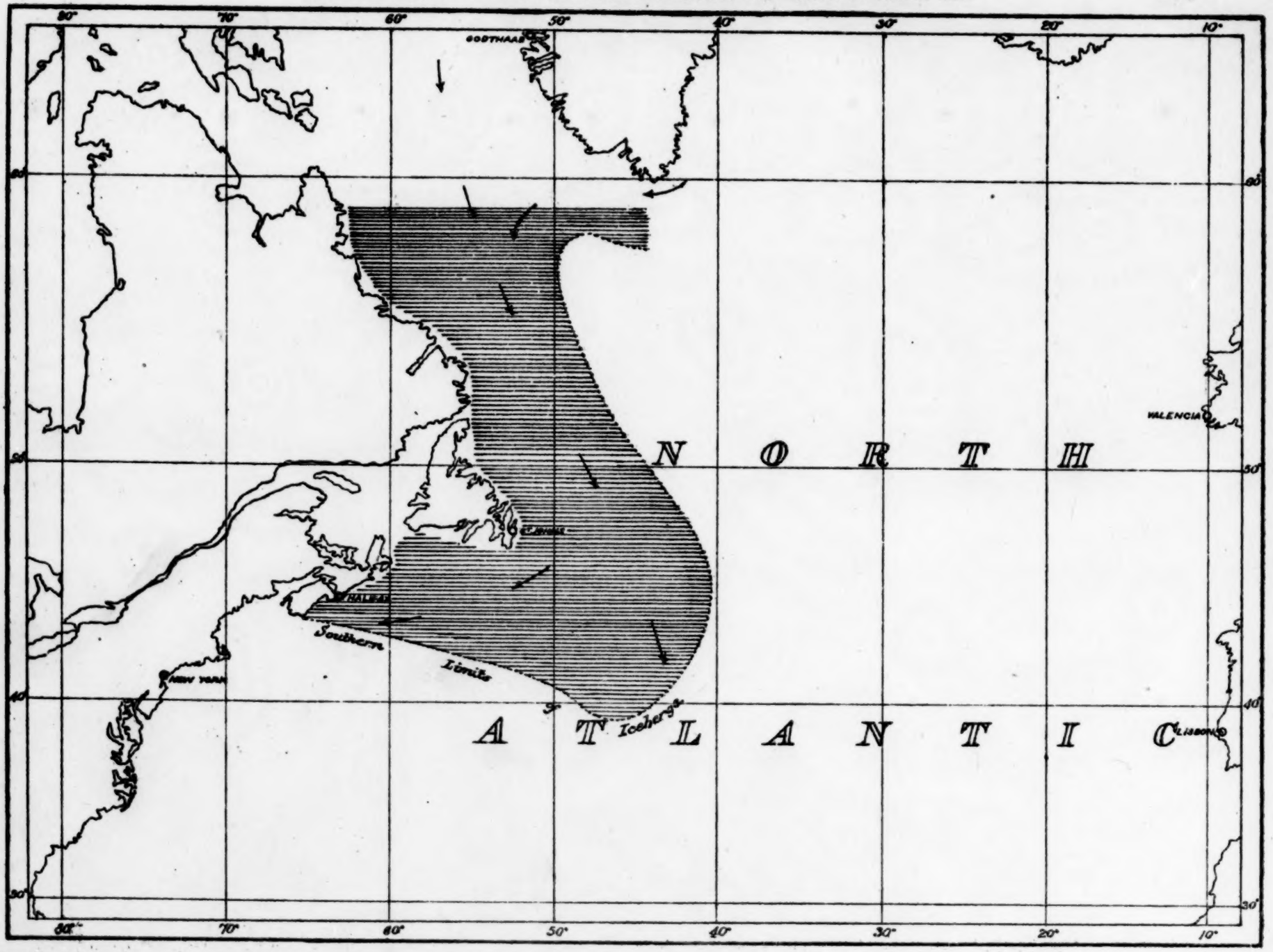



CHART SHOWING THE LIMIT OF ICEBERGS DURING THE MONTH OF APRIL, 1882. No. 7.